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ABSTRACT

This implementation guide is designed to provide practical, useful help to vocational and academic teachers, administrators, and support personnel in integrated academic and vocational instruction. The introduction defines integration, discusses assessment of the status of current programs and the assumptions underlying integration, and presents the rationale for integrating academic and vocational education. The following topics are discussed in chapter 2 on basic approaches to implementing integration: reinforcing academics in vocational education, tying academics to real life and using applied learning, achieving vocational and academic teacher collaboration, using major projects and themes, and planning major restructuring of schools. The next three chapters discuss what teachers (both individuals and teams), departments and entire schools, and administrators and support staff can do to integrate academic and vocational education. The final chapter examines ways in which obstacles to integration can be overcome. The following items are appended: a list of 50 implementation ideas, examples of projects and themes, examples of academic concepts reinforced in vocational education, examples of making academic concepts job relevant, and 36 integration resources. (Contains 16 references.) (MN)

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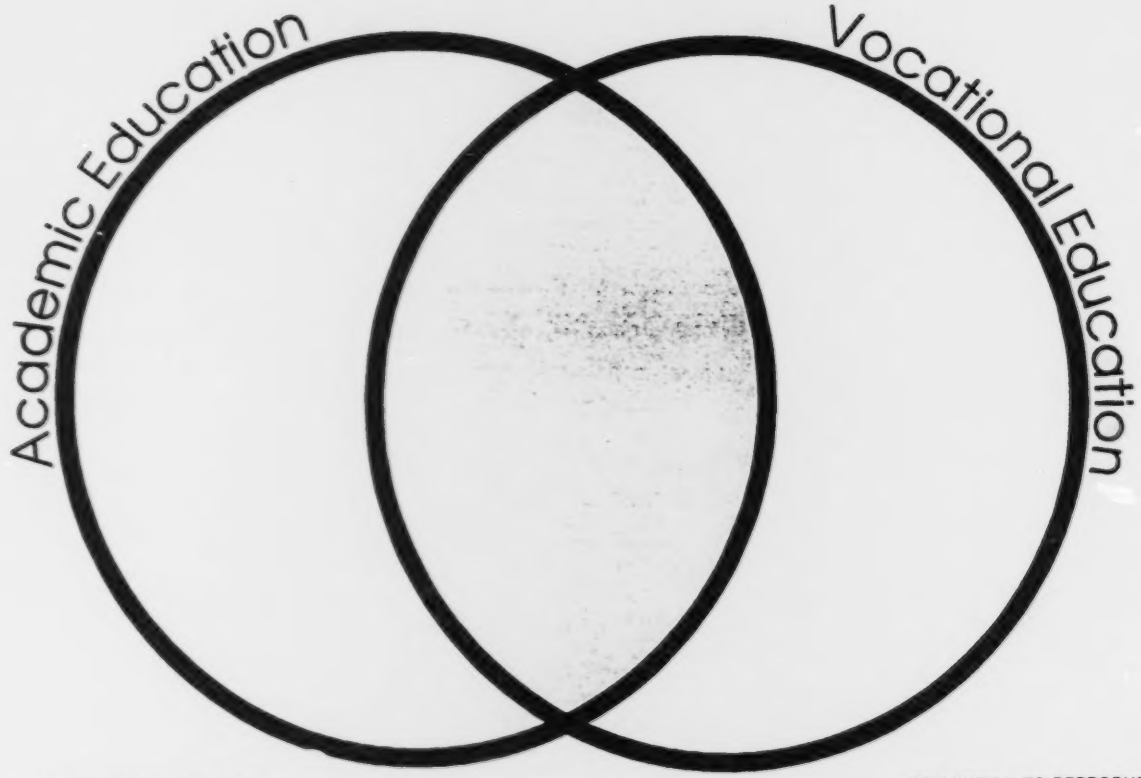
Integrating Academic and Vocational Education
Implementation Guide
Second In A Series



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Preface

This document is one in a series of related documents on integrating academic and vocational education:

Integrating Academic and Vocational Education -A Literature Review
Integrating Academic and Vocational Education -An Implementation Guide
Integrating Academic and Vocational Education -Best Practices in Florida
Integrating Academic and Vocational Education -Changes in Teacher Education

These documents and two, intensive week long integration institutes were part of a project funded in 1992 by the Division of Vocational, Adult and Community Education through the University of South Florida, The University of West Florida, and The University of Central Florida.

Integrating Academic and Vocational Education-An Implementation Guide has been prepared to provide practical, useful help for vocational and academic teachers, administrators and support personnel who are interested in more closely integrating the academic and vocational instruction students receive. Some of the ideas and suggestions contained in this document can be used immediately; others may have to be modified, expanded or reduced in scope to be useful for a particular classroom, department, school or school district.

The authors wish to express their appreciation to Dr. Wally Holmes of The University of West Florida and to Dr. Steve Sorg of The University of Central Florida for their valuable assistance and support in the integration project of which this document is a part. The authors also wish to gratefully acknowledge several of their academic teacher education colleagues in the USF College of Education for their active participation in the conceptualization and delivery of the integration institute held in Tampa during the summer of 1992 and for their support in promoting the restructuring of teacher education to promote the integration of academic and vocational education:

Dr. Joan Kaywell, Assistant Professor, English Education
Dr. Rick Austin, Assistant Professor, Mathematics Education
Ms. Michal LeVasseur, Graduate Assistant, Science Education

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Dr. Paulette Mainwood of the Division of Vocational, Adult and Community Education (DVACE), Florida Department of Education is gratefully acknowledged for her valuable assistance with the integration project, with the preparation of this series of integration documents and in supporting the improvement of vocational teacher education in Florida.

We sincerely hope that this document and the others in this series will be helpful to teachers, administrators and others in making academic instruction more job and life relevant for students and in enhancing the academic rigor of vocational education programs and in bringing academic and vocational educators closer together as equal partners in meeting the real life educational needs of learners.

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Introduction

What Is Integration?

Assess Where You Are Now

Assumptions Underlying Integration

Why Integrate Academic and Vocational Education?

Introduction

Few movements in education have generated as much attention from such wide corners of the profession as the movement to ***integrate academic and vocational education***. Should academic and vocational education be integrated? Is an academic foundation or is vocational preparation more important for today's students or do they need both? John Gardner in a now-famous quote, makes the case for the importance of excellence in both academic **and** vocational education:

> We must learn to honor excellence...in every socially accepted human activity, however humble the activity and to scorn shoddiness, however exalted the activity...An excellent plumber is infinitely more admirable than an incompetent philosopher. The society which scorns excellence in plumbing because plumbing is a humble activity and tolerates shoddiness in philosophy because it is an exalted activity will have neither good plumbing nor good philosophy. Neither its pipes nor its theories will hold water. (Gardner cited in Hull & Parnell, 1991, p. 24)

The nationwide movement to bring vocational and academic education closer together has generated interest, concern and criticism from academic educators, vocational educators, policy makers, business and industry leaders, teacher educators, state department personnel, local school leaders, teachers and others. Supporters herald integration as the perfect vehicle to mend the historical rift between vocational and academic education while critics decry it as a movement to make academics more "anti-intellectual" or to make vocational education more "academically elite". In reality, the integration of academic and vocational education is probably both of these--and more.

Even a casual observer of our modern high schools will notice the often vast separation between the vocational and academic programs, students and faculty. Rosenstock (1991) observes:

> One barrier to envisioning such an integration is the nearly total separation between academic and vocational education in today's high schools. Head and hand have never been farther apart. Vocational programs are often, literally and figuratively, in the basement of the school. They have become a "dumping ground,"

> and both the students and the teachers in these programs have the lowest status in the school.
>
> Vocational students are relegated to "working with their hands," with minimal and diluted academic content, as the system fulfills its prophecy of their limited potential. Often their teachers come from different social strata than those who teach, for instance, American literature or physics. And students tend to flow or be directed toward teachers from similar backgrounds. Almost everyone understands the "class-sorting function" of vocational education. Although they would use different terms, even 14-year-olds understand it.
>
> Pursuing integration with academic education requires us to adopt a different view: that vocational education is a different way to learn the same academic concepts and skills that nonvocational students learn. Vocational teachers see students demonstrate competence, thinking ability, and creativity in a vocational setting that some of them are unable to demonstrate in an academic setting or on a standardized test.
>
> Some schools claim to have achieved such integration, but too often this means only that students are seen as vessels into which both academic and vocational content is tossed. A true integration requires nothing less than a full restructuring of high schools. (p. 435)

Several major reports promoting school reform have addressed the issue of integration. The authors of *The Unfinished Agenda* prepared by the National Commission on Secondary Vocational Education observed that as most commonly configured, both academic and vocational education courses are isolated, arbitrary and fragmented pieces of learning that do not offer students opportunities to make connections about the interrelatedness of ideas, the implications and application of knowledge, and the process of discovery. The report called for a joint effort of vocational and academic educators to bridge the gap between theoretical and practical education. The W. T. Grant Foundation concluded that a mixture of abstract and experiential learning opportunities, a combination of conceptual study with concrete applications and practical problem solving offers one of the most hopeful approaches to improving the education of 20 million young Americans who are not college bound (Adelman, 1989).

Gray (1991) states that blurring the distinctions between academic and vocational education is becoming the mission of vocational education. Unfortunately, he relates, when the concept is put into practice, it typically gets degraded to mean only that vocational education students should take more academic courses. The primary goal of integrating academic and vocational education, Gray suggests, is to make the experience of applied vocational education more accessible to academic students at the same time that advanced academic courses are made more accessible to vocational students. Mixing the two groups of students would have benefits for all such as reducing the stigma now associated with vocational education and eliminating the social isolation experienced by many vocational students. Gray goes on to say that integrating the two areas may have the greatest benefit for the brightest students by giving them access to sophisticated lab equipment that can help them explore math and science concepts.

Historically, vocational education became separated from academic education as vocational programs and courses expanded and grew in numbers and importance. This chasm widened as federal legislation such as the Smith Hughes Act of 1917 set aside federal funds specifically for vocational education. Establishing separate vocational and academic tracks in America's secondary schools became more widespread as our schools enrolled more and more students of lower socio-economic status, more immigrants and more minorities. The thinking was that education ought to be differentiated according to the "evident and probable destinies" of students. Those destined for working class jobs should be in vocational tracks, while those bound for managerial and professional positions should be in academic programs.

This separation of academic and vocational education has periodically come under intense scrutiny. Grubb et al. (1991) report that the first major review of vocational education--the Russell report of 1938--criticized vocational education for promoting a narrow conception of vocational education with overly specific training and for encouraging a dual structure segregating vocational from academic education. The Russell committee recommended that vocational education be made more general and flexible and that it become better connected to the academic curriculum. Later reports which led to the 1963 Vocational Education Act and the 1968 Amendments continued to criticize vocational education for its narrowness and job specificity and tried to make vocational education more general.

Although the integration movement is not new, it gained its most significant recent impetus with the passage of the Carl D. Perkins Vocational and Applied

Technology Act of 1990. The act mandates that state and local agencies across the nation "integrate academic and vocational education in such programs through coherent sequences of courses, so that students achieve both academic and occupational competencies."

What Is Integration?

What is integrating academic and vocational education? Pritz (cited in Kolde, 1991) defines it as "the linking of academic skills instruction to vocational applications to enhance student learning" (p. 454). Norton et al. (1987) suggest that it means

> the idea of a pure liberal arts curriculum as a preparation for life may have been viable for the landed gentry of earlier centuries and for those today who wish to remain in an academic or pure research environment, but it is not generally viable today. It means that a general education curriculum, preparing a person neither for further education or the world of work, may, in the view of many people, never have been a viable option. And it means that the idea of a pure technical skills curriculum as a preparation for life in today's postindustrial information/service society is equally absurd. (p. 5)

The authors of this document offer an operational definition of the integration of academic and vocational education that, hopefully, will be helpful to academic and vocational educators involved in implementing integration strategies. The integration of academic and vocational, we suggest, is:

> The modification of academic and vocational education philosophies, student outcomes, curriculum and instructional strategies aimed at making academic content job and life relevant and making academic learning activities more applied. It involves using vocational education settings to reinforce and apply academic skills and content. When integrated, academic education becomes more life relevant and career focused and more hands-on and vocational education becomes more academically rigorous and less narrowly focused on preparing students for specific jobs.

Let's look at some specific examples of what successful integration "looks like" in schools.

- A chemistry teacher at Southwest High School in Fort Worth, Texas turning traditional teaching methods "inside out" by having students work together to solve problems rather than spend most of their time listening to the teacher "teach". One of their major projects is to determine the most effective, economical and environmentally safe grass fertilizer for the front lawns of all 105 schools in the Fort Worth Independent School District (applied learning strategy and job relevance).

- Welding students at Crossland High School in Temple Hills, Maryland being taught how to write paragraphs in complete sentences about the planning, safety and procedural aspects of a major welding fabrication project and to how to make detailed mathematical calculations regarding materials and costs (vocational education reinforcing academics).

- A science teacher and a home economics teacher at Karns High School in Knoxville, Tennessee jointly teaching a course in "Nutrition Science" which includes the study of biochemical compounds, microbial changes in foods, global nutrition, and other science and foods concepts interwoven together (teacher collaboration).

- A physics teacher teaching the concept of momentum by having the class actually determine how many weights (mass) dropped from various heights (velocity) it takes to crush a certain number and type of aluminum can or cardboard structure rather than teaching the concept using the traditional means of lecture, chalkboard, textbook readings and homework (applied learning strategy).

While these examples by no means cover the wide range of settings and strategies that can be used to integrate academic and vocational education, they do offer a glimpse of the kinds of things teachers can do to make ***academics more job relevant*** and to make ***vocational education reinforce academic skills***. Later sections of this document describe in some detail a variety of models, approaches, strategies and methods that can be used to implement the integration of academic and vocational education.

Assess Where You Are Now

Another way to explore the concept of integration is for you to determine where along a continuum from "fully integrated" on one extreme to "barely integrated" on the other that academic and vocational education are in your school right now.

Take a few minutes to reflect on what is taking place in your school right now as you carefully review the 10 questions listed on the next page.

For each question, indicate the **degree** to which it applies to your school by using the numbers 1 through 5 with:

1 = "Not at all or very little";

3 = "We're talking about it but we're not doing much yet;

5 = "A great deal or to a large extent":

Be sure to respond to each item to accurately reflect what is acutally going on in your school--not what you would like to be happening. Remember to reflect on current practice throughout your school and not just in your particular program or department. You might even want to get some input from fellow teachers or even from students as you respond to these 10 questions (see following page for questions).

How Well Are Academic and Vocational Education Integrated in Your School?

____ 1. To what extent do the future realistic occupational and adult life role needs of students determine the specific academic content students must learn?

____ 2. To what extent are math content and math teaching methods and learning activities tied directly to how math is actually used in the real world?

____ 3. To what extent are English content and English teaching methods and learning activities tied directly to how language is actually used in the real world?

____ 4. To what extent are science content and science teaching methods and learning activities tied directly to how science skills and principles are used in the real world?

____ 5. When learning academic and when learning vocational content, to what extent are students usually engaged in learning activities that deeply engage them mentally, physically, socially and emotionally?

____ 6. To what extent do vocational and academic faculty regularly meet to closely coordinate content and its sequence and relatedness to make learning more efficient, coherent and meaningful for students?

____ 7. To what extent are major projects and themes used to tie all content (including vocational and all academic) together in an applied, integrated, coherent fashion?

____ 8. To what extent do vocational teachers regularly point out to students, reinforce and, if needed, provide instruction in the specific academic skills and concepts underlying the vocational competencies students learn?

____ 9. To what extent do academic and vocational teachers require students to engage in higher order, problem solving and creative activities and skills?

____ 10. To what extent does the formal testing done by teachers require students to perform the same types of skills and activities they will in real life (e.g., solve relevant problems, create solutions, perform on a team, etc.)?

Now that you have responded to the questions, take a minute to add up your total points for all 10 questions.

Here is a guide to help you interpret your total score:

Score between 0 and 15: You've got a long way to go but it's worth the effort--get started! Academic and vocational education are still pretty separate in your school.

Score between 16 and 35: You're doing some great things but keep up the effort! Academic and vocational education teachers are beginning to talk about integration but the two disciplines are still pretty separate right now.

Score between 36 and 50: You're almost there; your's should be a model integration site! Vocational and academic education are highly interconnected; teachers in the two fields work closely together to integrate what students learn.

The higher the number, the further along the road you are to fully integrating academic and vocational education throughout your school. Although this is not a "scientific" instrument for determining the degree which vocational and academic education are actually integrated in your school, it should give you some general idea about how closely these two disciplines are being interconnected for students.

Of course, you could choose to answer these 10 questions for your entire school district, a single department, several departments or for your entire school. You might also choose to answer them for just your discipline, a number of disciplines or for all subject areas. You could also answer them for certain grade levels or for all levels.

It might be interesting to ask several other teachers to respond to these questions and then compare notes. Consider asking vocational and academic teachers to respond; it should be revealing to look at their different perceptions about what is happening in your school. Another interesting approach would be to ask administrators to answer the questions and then compare their responses with those of teachers, both vocational and academic.

Getting input from students would also be revealing. They should be able to provide some insight into how closely the academic concepts and skills they learn are tied to the real world and to what degree vocational teachers reinforce academics. They may also be able to provide concrete suggestions to teachers and administrators as they go about the process of implementing integration strategies.

Assumptions Underlying Integration

The concept of integration is based on several important assumptions supported by recent research. These assumptions were well articulated by Sandra Pritz (1988):

1. Academic basic skills are imbedded in vocational tasks. Working together, vocational and academic teachers can identify exactly where academic concepts are covered in vocational courses in order to enhance them, highlight them and even award credit for them.

2. Vocational tasks provide for realistic use of academic basic skills. Often academic textbooks do not provide sufficient opportunities for students to practice such skills. Connecting academic learning with application strengthens students' understanding and builds the skills they need for solving problems and making decisions.

3. Neither academic basic skills nor vocational skills should be taught in isolation from each other. All teachers need to make students aware of the bonding between the two.

4. Differences in learning styles and teaching styles may have a significant impact on students' success in acquiring basic skills. If some students learn best through an abstract approach and others through concrete application, schools had better provide for both. (p. 18)

Another major assumption underlying the integration movement is that the "constructivist" view of learning is the most appropriate. There are two major aspects to the constructivist teaching philosophy (Duckworth, 1987). First, we should put students into direct contact with the phenomena or concepts to be learned--the **real thing**--not just books and lectures about them. Secondly, we

should challenge students to try to explain the sense they are making, listen to them and try to understand their sense instead of explaining things to them. As students try to explain, they also begin to question and seek out more information to shed light on the subject in the process of constructing their own knowledge of the subject. These assumptions call for applied learning, discovery learning, introspection, reflective learning, and similar student centered approaches.

Why Integrate Academic and Vocational Education?

Certainly, making major changes in the way academic and vocational education are structured and delivered will require some major expenditures in terms of time, money, frustration and effort. Why do it? Why should academic and vocational education be brought closer together? Why should they be integrated? Although not all inclusive, following are some of the important reasons why integrating academic and vocational education is needed.

To Improve Basic Skills of Students

There have been numerous commissions, reports and studies recently that have documented the serious problem of students completing high school without mastering many of the workforce basics. Many students complete high school and some complete a vocational education program and still lack essential basic skills such as computing, writing, and problem solving.

One of the most recent and most comprehensive such reports is the SCANS report. The Executive Summary (SCANS, 1991) states the problem very well

> The message to us was universal: good jobs will increasingly depend on people who can put knowledge to work. What we found was disturbing: more than half our young people leave school without the knowledge or foundation required to find and hold a good job. These young people will pay a very high price. They face the bleak prospects of dead-end work interrupted only by periods of unemployment. (p. 1)

After surveying thousands of employers and workers all across the country, the SCANS Commission identified what they have called "Workplace Know-How". This know-how consists of basic, "foundation skills" in three areas and "workplace competencies" in five areas (SCANS, 1991):

Foundations Skills:

√ **Basic Skills**-reading, writing, arithmetic, math, speaking and listening.

√ **Thinking Skills**-ability to learn, reason, think, make decisions and solve problems.

√ **Personal Qualities**-individual responsibility, self-esteem, self management, sociability and integrity.

Workplace Competencies:

√ **Resources**-how to allocate time, money, materials, space and staff.

√ **Interpersonal Skills**-can work on teams, teach others, serve customers, lead, negotiate, and work well with people from culturally diverse backgrounds.

√ **Information**-can acquire and evaluate data, organize and maintain files, interpret and communicate, and use computers to process information.

√ **Systems**-understand social, organizational, and technological systems; can monitor and correct performance and can design or improve systems.

√ **Technology**-can select equipment and tools, apply technology to specific tasks, and maintain and troubleshoot equipment.

To help students attain this important workplace know-how, the SCANS Commission recommended that ***academic and vocational education be integrated.*** In the SCANS report entitled *Learning A Living: A Blueprint For High Performance*, the SCANS Commission (SCANS, 1992) reported

> Vocational education can shape itself into high-performance centers for training by incorporating the SCANS foundation skills into its curriculum. Reading, writing, math, and science are currently being woven into vocational studies to enhance the ability of students to achieve the SCANS workplace competencies.

> Recognizing the need to teach basic academic, thinking, and interpersonal skills, vocational education is also progressively becoming a team-teaching effort. Academic and vocational teachers work side by side to reinforce the relevance of academics by demonstrating how they apply to the high-performance workplace. (p. 37)

To Provide A Setting That Promotes Learning

In a recent report issued by the National Association of State Directors of Vocational Technical Education Consortium (no date), it was stated that

> Recognition is growing that the application-oriented setting of vocational programs can provide an avenue to basic academic skills acquisition, enhancement, and transference. As more is learned about the importance of learning styles in the acquisition of academic skills, there are implications for the way in which schools tend to be structured in favor of students with strong auditory and visual skills. If it is confirmed, as has been asserted, that learning styles of low-achieving students tend to be weak in the auditory and visual areas but high in the kinesthetic and tactile areas, then the hands-on participatory nature of instruction found in vocational classrooms will serve them well. (p. 4)

Dale Parnell (1991), a leader in the Tech Prep movement states that cognitive-learning research is discovering that intelligence and competence develop best out of interaction between obtaining knowledge and applying that knowledge and shatters long standing artificial distinctions between the two such as:

> * "head" work and "hand" work,
> * academic and vocational education,
> * knowing and doing,
> * education and training,
> * theoretical knowledge and applied knowledge. (p. 11)

Grubb et al. (1991) describe how integrating academic and vocational education can provide an applied setting which promotes learning.

> The voices of education critics have been joined by those of cognitive scientists, a loose network of psychologists,

> anthropologists, sociologists, and students of artificial intelligence. One conclusion from this emerging field is that knowledge (especially expert knowledge) is often specific to a particular activity or area of expertise, and that for most people effective learning requires a context that matters to them. In particular, most learning takes place in ways quite different from the form it takes in schools. (p. 83)

The work of Howard Gardner of Harvard University (1983) is gaining considerable attention by helping educators (particularly academic educators) focus on the notion that people have "multiple" intelligences--all equally valuable to us in our complex world. He dispels the myth that there is one central construct of human intelligence that can be measured by an intelligence test that should limit the degree to which students can succeed in school. Gardner suggests that a true human intelligence must measure up to a rigorous set of criteria such as physical isolation of that "ability" in the brain, the existence of prodigies or savants with that ability, an evolutionary history, a distinctive developmental history and several other criteria.

Using these criteria, Gardner has identified seven multiple human intelligences:

1. Linguistic
2. Logical-mathematical
3. Musical
4. Spatial
5. Bodily-kinesthetic
6. Interpersonal
7. Intrapersonal

Gardner suggests that each of these human intelligences is of equal value or worth. He adds that it is unfortunate that our schools, curricula, teaching methods and testing practices focus almost exclusively on the first two--linguistic and logical-mathematical--intelligences and virtually ignore the other five. These two intelligences, Gardner suggests, are far less important to most adults in the real world than they are to success in school. He proposes radically changing the school curriculum to engage as many of the human intelligences as possible. It takes little imagination to see that a fully integrated curriculum using applied learning strategies, hands-on, vocationally oriented learning activities and student centered techniques like cooperative learning would engage a far wider range of human intelligences than is currently the case. Gardner is currently working with

several schools to assist teachers in restructuring their curriculum and teaching methods so that all the human intelligences are engaged to some degree during the typical school day.

Adding to the mounting evidence than an integrated approach to curriculum promotes effective learning is the work of Caine and Caine (1991). They have extensively reviewed the literature regarding the link between integration and student learning. They make the following observations:

1. Effective learning is "brain-based" learning which means that teaching and learning are consistent with how the human brain learns most effectively and efficiently. Brain-based teaching acknowledges the brain's rules for how teaching and learning should happen.

2. The brain has an enormous innate capacity to deal with parts and wholes simultaneously. The brain can deal with the interconnected, interpenetrating, "holographic" world, **provided it is encouraged to do so**. One common element of effective methods is a sense of "embeddedness"--a sense of wholeness that emerges out of seeing how subjects relate to each other and how people relate to them. Integration of the curriculum is one approach to learning that is so powerful because it **orchestrates complex experience in a way that takes advantage of what the brain does well.** It does not limit the brain by teaching the memorization of isolated facts and details.

3. Brain research confirms that multiple complex and concrete experiences are essential for meaningful learning. This means using the brain's infinite capacity to make connections and understanding what conditions maximize this process.

4. The brain is a parallel processor and can be viewed as holographic, global or interconnected. The brain appears to have an innate ability to look for patterns.

5. Student learning style becomes less important the more we use brain-based learning. The more we approach meaningful, challenging, and relevant learning, the more likely that students of all types will learn well.

6. The brain processes parts and wholes simultaneously. People have enormous difficulty learning when either parts or wholes are overlooked.

To Refocus the Mission and Structure Of Our Schools

Virtually everyone agrees: our schools are not working very well--particularly our secondary schools. Students seem disinterested and bored, they drop out in unacceptably high numbers, too many students remaining in school just go through the motions often causing serious problems with crime and violence, employers lament their poor preparation and most students who do graduate and go on to college must engage in remedial activities to learn the basic skills they should have learned in high school. Parnell (1991) discusses five very important improvements that integration and similar initiatives can bring to our high schools and ultimately to our postsecondary institutions:

> Five substantial enemies stand in the way of excellence in the modern American school and college educational program.
>
> First, we have allowed the traditional college prep/baccalaureate degree curriculum to be the one and only definition of excellence in education.
>
> Second, in too many instances, we have allowed the curriculum to become disconnected from real-life issues. Teaching and learning in formal education usually takes place outside the context of real-life situations, activities, and problems. Studies have shown, however, that most individuals learn best when they are taught in a context of application.
>
> Third, scant attention has been given in education to the subject of continuity in learning. As a result, American schools and colleges have become a collection of disjointed courses that, more often than not, fail to connect with one another and with the students they want to teach.
>
> Fourth, little attention has been given, in defining educational excellence, to the pressing dilemma of how to meet the great range of individual difference among students.

> Fifth, we have allowed too many students--even those in so-called vocational education programs--to graduate from secondary schools and even postsecondary programs without the competencies required to secure entry-level employment in a rapidly changing environment, or the flexibility to retrain later as job-market requirements change. This group of students can be called "the neglected majority". (p. 3)

Some quotes from a recent ASCD *Curriculum Update* (Willis, 1992) that highlight the need to restructure our schools around an integrated curriculum include

> The trend toward interdisciplinary instruction is a great movement on many, many fronts, including colleges, national organizations, and state education departments. Across the country you'll see an incredible increase in the number of teachers who are bringing units of study together sensibly.
>
> The real world isn't divided into separate disciplines...children are interested in the entire world around them...it doesn't make sense to them to say "math" or "social studies". When instruction jumps from one discipline to another every 45 minutes, learning is fragmented unnecessarily...The disciplines are contrived ways to give people information...The world operates as a whole. In short, experts contend, the disciplines are artificial and they splice learning into fragments that may never cohere.
>
> The argument that teaching through the disciplines is efficient does not cut much ice with these experts. Efficiency is dependent on effectiveness...In discipline-based instruction, the teacher may very quickly get through material, but the kids may not have gotten anything out of it...the disciplines are an efficient vehicle for coverage--not learning. Although discipline-based instruction has enabled teachers to plow through lots of content, kids aren't coming out as competent human beings.
>
> A second major benefit of interdisciplinary instruction is its power to motivate students...Interdisciplinary themes and projects capture students' interest, increasing their level of concentration...Also motivating is the higher reality quotient of interdisciplinary studies...

> We have known for a long time that students learn more, remember more, and apply knowledge more when they are taught in an interdisciplinary mode...Students need to see the whole context of what they are learning...When they do, they thoroughly understand; they're not just doing rote memorization. Students' learning is richer when they are taught in an interdisciplinary mode because drawing connections between subjects requires students to do more higher-level thinking...You really have to understand things better to put them together... (pp. 2,3)

To Reduce The Tracking and Differentiation of Students

One of the serious problems arising from the separation of academic and vocational education in our schools has been the separation and tracking of students. Too often, better students are tracked into the college preparatory track, lowest ability students are tracked into vocational programs and the "forgotten majority" of students in between are funneled into a "general track" which does not lead to further education or to productive employment beyond high school.

There is substantial evidence that the tracking of students in this way reduces the performance of students in lower tracks and fails to improve the performance of those in upper tracks. One of the promises of the integration movement is to combine academics and vocational education and, therefore, combine students who would otherwise be separated into separate tracks--rarely interacting with one another either academically or socially.

Basic Approaches To Implementing Integration

Reinforcing Academics in Vocational Education

Tying Academics to Real Life and Using Applied Learning

Vocational and Academic Teacher Collaboration

Using Major Projects and Themes

Major Restructuring of Schools

Basic Approaches To Implementing Integration

There are as many ways to successfully integrate academic and vocational education as there are people doing it. This section describes several broad approaches or "models" that have been shown to be successful. Hopefully, these will serve as a framework within which you can implement your own specific strategies. Although much of the literature (and the related documents in this series on integration) often refer to eight models or approaches to integration, we have combined several similar or closely related models resulting in five models. This was done to help keep things as simple and straightforward as possible. Let's look at these five broad approaches that are being used to successfully integrate vocational and academic education:

Reinforcing Academics in Vocational Education

1.
Vocational education instructors teaching and reinforcing specific academic concepts and skills as they deliver instruction to students in their vocational classes.

This is one of the most fundamental and important approaches involved in successful integration. It involves vocational instructors making a concerted effort to reinforce academics as they prepare and deliver instruction in their vocational classrooms, shops and laboratories. This approach has proven to be highly effective because it provides relevance, meaning and practical application for the vocational student to learn and apply academic concepts and skills.

Too often, when academic concepts such as sentence structure, thermal expansion, chemical reactions, and converting fractions to decimals are taught as a part of academic courses students have little or no idea how these concepts can actually be used. When these academic concepts and skills are reinforced (or taught initially) in a vocational education setting students can see first hand the practical job related uses of the concepts. They can see that the concept of thermal expansion is critical to making a good weld and that sentence structure is essential to writing a technical report. Suggestions for vocational instructors who want to begin or expand their reinforcement of academic skills and concepts include:

- Go ahead and make the commitment that you're not "just" a vocational teacher. Your job is to provide both **training and education** to your students. Vocational competencies and important basic skills will allow your graduates to secure, maintain and advance in their chosen employment field.

- Generate a complete list of the specific "competencies" or tasks that you teach in your vocational program if you do not have one already. This will then help you pinpoint the academic skills that support and underlie the vocational competencies you teach. On the next two pages are examples of the kind of competency statements to include on your list. A suggestion is **not** to use the state list of Student Performance Standards (SPS's) **verbatim** as your list of competencies but to use the SPS's as one source to use in developing your list of competencies. Notice that the competency statements on the next page all:

  - are activity oriented and require some sort of active learning on the students' part;

  - begin with an action verb and describe what the student will be able to **do**--rather than just **know**;

  - are about the right "size" for a separate unit of instruction;

  - usually emcompass several (sometimes up to four or five) specific performance standards from the Curriculum Frameworks;

  - often involve higher level performance.

- Mentally (or physically) walk through the performance of each competency you teach and determine the specific academic concepts and skills necessary to learn and perform the competency safely, competently and efficiently. Areas in which you might want to identify underlying academics include mathematics, physics and/or physical science, chemistry, biology, English (grammar, punctuation, spelling, etc.), communication skills (listening, speaking, etc.) and history.

- Another approach might be to develop a matrix linking each of your vocational competencies with each of the SCANS workplace know-how elements. It is recommended that vocational teachers work closely with

their academic counterparts to pinpoint these academic skills. The drafting teacher, for example, knows that certain geometry principles are involved in creating an "auxiliary" view. The geometry teacher, however, can help the drafting teacher pinpoint exactly which geometry concepts are involved and might provide suggestions or assistance in teaching them.

- If you are less than proficient in any academic concept or skill that should be reinforced as a part of your program, invite the appropriate academic teacher to work with you and assist you in developing the instruction or, perhaps, doing the reinforcement themselves. After all, you can't be expected to be highly competent and experienced in your vocational area **and** be an expert in math, science, English and all the other academic areas as well.

- If certain academic concepts and skills are vitally important to success on the job for your students or if certain academic skills cut across many of the vocational competencies you teach, you may want to include them as formal competency statements on your list of competencies you teach (and test) in your program. For example, a cosmetology instructor might determine that the academic concept of ph is an important component of many cosmetology competencies dealing with hair coloring, shampoos, conditioners, etc. That teacher might decide to make it a formal competency taught and tested in the cosmetology program. It might be listed on the cosmetology competency list something like "Apply the concept of ph to cosmetology".

- Other academic skills that pertain to only a few vocational competencies or that may not be considered of vital importance might simply be taught as an integral part of the vocational competency where it applies and would, therefore, not appear as a formal competency statement on the vocational competency listing. Such an example might be the concept of how roots extract nourishment from the soil which might be integrated into an agribusiness instructor's lesson for teaching the competency "Prepare soil mixtures".

Examples of Student Competencies

Home Health Care

Measure and record blood pressure
Trace blood flow through the circulatory system
Assist client in dressing
Dispose of biohazardous wastes
Assist client to ambulate
Respond to emergency situations

Electrical Wiring

Cut and thread conduit
Compute and measure voltages in series circuits
Apply connectors
Install and wire load center
Locate information in electrical code
Select wiring and cable

Career Development (SAIL Lab)

Select career exploration materials for areas of interest
Determine own strengths and weaknesses
Develop short and long range goals
Prepare resume
Develop job search plan

Home Economics (Child Care)

Supervise outdoor play
Plan meals for preschoolers
Provide safe and healthy environment
Interact with parents
Respond to medical emergencies

Secretarial

Key two page letters
File and retrieve business documents
Maintain petty cash records
Follow oral and written instructions
Develop efficient itinerary

Examples of Student Competencies (cont'd)

Sales and Marketing

Conduct sales on account
Negotiate price
Expedite orders
Set up exhibits and displays
Handle customer complaints

Language Arts

Form and use possessives
Analyze plot
Alphabetize
Locate information in books
Interpret and use slang

Basic Math

Add and subtract fractions
Convert fractions to decimals
Solve simple algebraic expressions
Determine volume of common solids
Determine area of common polygons

Horticulture

Prepare planting beds
Install sprinklers
Transplant seedlings
Select and apply fertilizer
Apply mulch

- Yet another approach could be to generate a detailed matrix cross referencing each of your vocational competencies with the specific academic competencies that underlie each. Upon completion of your program, your graduates might receive a certificate as well as a copy of this matrix indicating to employers and others which academic concepts and skills were reinforced in the vocational program. Such a matrix might also serve as a structure within which academic and vocational teachers might collaborate.

Tying Academics To Real Life and Using Applied Learning

2.

Academic teachers tying academic skills and concepts to current and future job and life roles of students and delivering instruction using more hands-on, applied learning techniques.

This is one of the most powerful strategies involved in integration. It addresses **what** is taught in academic classes and **how** it is taught. Often treated as two separate models in the literature, these two approaches go hand in hand so well, we have combined them into one. This model helps make learning interesting and motivating and helps to answer the very important question students constantly ask: "How am I ever going to use this?" Research (and common sense) suggest that one of the primary causes of poor school performance, lack of interest and motivation, absenteeism and dropping out is that many students see no real use for much of what they must learn in school. Learning how to conjugate verbs because the teacher says so or taking Algebra I simply because it's a prerequisite for Algebra II is not sufficient motivation for many students to want to put forth their best effort. Students want to know why they should learn what we have to teach.

Ways in which academic instructors can tie academic concepts to the current and future lives of students, thus adding much needed meaningfullness to what is being taught include:

- Have students actually identify the many real life activities they currently engage in which could be used as vehicles to show relevance of important academic concepts. Examples of such real life activities typical secondary students might be engaged in include applying for part-time work,

managing their own finances, purchasing a used car or car insurance, writing letters to friends and relatives, engaging in wellness activities such as exercise and proper diet, dating, settling disputes among peers and many others. The above activities could be used to provide **real world application** for academic skills such as graphing data, writing effective paragraphs, speaking persuasively, principles of nutrition, locating and interpreting information and a host of others.

- In addition to tying academics to the everyday lives of students, try to tie academic concepts and skills to the current and future work lives of students. Show students specifically why technicians need to be able to spell correctly, why construction workers need to be able to convert fractions to decimals, why wildlife officers need to know about geography and typography, etc.

- When possible, use instructional materials taken or adapted from actual work settings. Let students see the complexity of technical manuals, job orders, and instructions for instruments and equipment.

- Utilize guest speakers from actual work settings. However, avoid using only doctors, lawyers, managers and other college trained professionals when using guest speakers. Invite speakers from a wide range of blue collar as well as professional careers.

- Arrange for brief field trips where your students can actually see workers utilizing academic skills such as math, writing, reading, science, speaking, etc.

The second part of this strategy has to do with **how** we actually deliver instruction in academic concepts and skills in schools. Far too often, we teach English, math, science and other academics using the four tried and true techniques: lecture to students, write stuff on the blackboard, have them read the textbook, and assign homework. Unfortunately, many students (and teachers) find this boring and simply tune out. Recent research suggests that for learning to be effective, we must engage learners psychologically, physically, socially and emotionally. In other words, we must engage the "total learner" in the learning process for learning to become interesting and effective. This requires the use of what has become known as "applied learning techniques".

Applied learning requires the instructor to **facilitate learning rather than to do all the teaching** and to provide appropriate, structured activities that **get the learner totally involved in applying, using and thus "owning" what was presented**. These concepts are certainly not new, however, recent research underscores the importance of using them and the integration of academic and vocational education now provides the perfect vehicle for using such techniques. Applied learning involves having students engage in the same kinds of activities in school that they will be involved in when they are in the workplace. This involves working with others as a team or work group, solving real problems, creating products, completing projects and seeking answers to questions for which an answer does not yet exist. Suggestions for teaching academic subjects in a more applied fashion include:

- Try to engage as many of the senses of students as possible when teaching difficult or abstract academic concepts. Engage students visually, auditorialy, kinesthetically, and socially. Research shows that the more senses or learning channels involved, usually the more effective the instruction is for more learners. Avoid lengthy lectures with little opportunity for students to get involved.

- After presenting an academic concept to students, have them actually use and apply it in a **concrete** manner if at all possible. When teaching how to compute the area of a rectangle, for example, have student teams actually measure the area of things in the room such as walls, windows, chalkboards, the floor, etc. They will be mentally, physically and socially engaged which will be far more effective than if they work some problems from their textbook. You are limited only by your imagination as to the applied activities you can come up with. Activities like making pizzas to teach percentages and fractions, writing real letters to congress about major issues to teach writing, tracing the history of a local family to teach elements of history will make academic learning much more meaningful and enjoyable for both students and teacher.

- Frequently, use cooperative learning as the instructional method for applied learning. Cooperative learning has become quite popular and is in widespread use so we will not go into much detail about it here. See your principal, director or contact your supervisor to find out more about cooperative learning. Essentially, cooperative learning involves having the teacher break up the class into small groups of usually from three to six students who complete pre-planned, structured learning activities in which

every student has an important role to play and the success of the group and the success of each individual in the group are interdependent.

- Locate and utilize already prepared "applied" materials such as the "Applied Academic" materials developed by the Center for Occupational Research and Development (CORD) and the Agency for Instructional Television (AIT). These materials consist of video presentations, applied learning activities, and student workbooks that tie academic concepts to the world of work and teach them in an applied manner. These materials are available in Physics (Principles of Technology), Applied Math, Applied Communications, and Applied Biology/Chemistry with others to follow (See Appendix E).

Vocational and Academic Teacher Collaboration

3.

Vocational and academic teachers collaborating to jointly plan and deliver instruction, reinforce one another's content and sequence and link their instruction to emphasize the connectedness of academic and vocational education.

This important approach requires vocational and academic teachers to work closely together in concert to ensure that academic and vocational education are reinforcing and supporting one another. This requires academic and vocational teachers to break down the artificial barriers that often exist between the two. Academic teachers may find themselves visiting vocational teachers in a part of the building or campus they have never set foot in before. Vocational teachers may have to get over their feelings of inadequacy as compared to their academic counterparts and visit their classrooms as well. Suggestions for effective collaboration include:

- Work with your supervisor or administrator and arrange for a common planning time so that vocational and academic teachers have regularly scheduled time to meet together to collaborate.

- Share a list of the competencies taught in each of the academic and vocational courses and programs. You will be amazed at the overlap

between what is taught in academic courses and in some vocational programs (and between vocational programs as well).

- When academic and vocational teachers have the same students in their classes, it is a good idea to look for duplication of competencies in the academic and in the vocational curriculum. Where you find duplication of competencies being taught, make sure that common approaches and terminology are being used to reduce confusion on the student's part or you may decide to eliminate the duplication and only one of you teach it. For example, a home economics and a math teacher may, upon examining one another's competencies, realize that they are both teaching the concept of ratio and proportion.

  They might make one of several decisions regarding this duplication. They might decide that both will continue teaching it, however, they will both teach it during the same week so that one will reinforce the other. Or, rather than both teaching it, they may decide that the home economics teacher will teach it since he or she is already set up to teach it in an applied fashion by modifying recipes. Of course, other decisions could have been made such as team teaching it.

- Get familiar with one another's classroom, students, textbooks, and curriculum. Visit one another's classroom, combine your classes occasionally. A math teacher, for example, might want to arrange for an in-school field trip for a math class to visit the industrial, agricultural, business education and home economics classrooms and laboratories so that practical applications of math can be pointed out and actually applied hands-on. A business education teacher might want to combine the business education class with a creative writing class so that the combined group can talk about creative writing and then word process their assignments.

Using Major Projects and Themes

4.
Use major projects and themes as a vehicle to integrate and apply learning from many disciplines or subject areas.

Using major projects and themes can be an exciting way to integrate not only academic and vocational education but also to integrate multiple academic subject areas. The project is more of a "how" and theme is more of a "what". Let's examine each. A major project is usually an assignment that requires individuals or groups of students to carry out multiple creative and problem solving activities and make decisions along the way toward creation of some finished product or result. Projects usually span a number of weeks or months and often are worked on for part of the regular class period while the regular instructional program continues. The nature and scope of the project dictates the degree to which various vocational and academic competencies are put into practice as the project is executed. Major projects may be assigned by an academic teacher and worked on primarily in the academic classroom but may involve input by the vocational teacher and/or students or the reverse may be the case.

Let's look at an example to see how a major project might be used to integrate the curriculum. A fairly large scale project might be to have several students plan and execute an "experiment" over a six month period to reduce the amount of air pollution generated by the cars driven to school by faculty, staff and students. Activities they might engage in might be to research the whole area of automobile generated air pollution and determine how it is generated, the chemical processes involved, etc. and then by surveying the present driving habits of drivers, determine and graphically depict the estimated current level of pollution generated.

Next, they might research ways in which companies and municipalities and individuals have reduced pollution. They might then implement these strategies with faculty, staff and students. These might include organizing car pools, encouraging biking by students, performing a complete tune up on everyone's car and others. At the end of six months, students might then assess how drivers have changed any habits and estimate the reduction in pollution resulting from the tune-ups. Results could be written up in the form of newspaper articles, technical reports, graphs, charts, etc. using word processing and desktop publishing.

This hypothetical project involves concepts and skills from multiple areas including science, math, language arts, automotive technology, technology education, business education and others. Most importantly, it might provide a **vehicle** which can be used by academic and vocational teachers to make their instruction **real** and **applied** for students. They can see that what they are learning can being used today--not some time in the distant future.

Of course, projects can be of much smaller scale involving a single student or students in a single class. They might, however, involve the students from several classes such as horticulture and biology or physics and electronics or marketing and speech. Occasionally, an entire school may be involved in a massive project with each department, grade level or other cluster of students responsible for a specific portion of the project. Projects used for integration can be quite utilitarian such as the carpentry program (with the assistance of the math class) designing and building playground equipment for a nearby elementary school. Here are some criteria you might keep in mind as you select major themes and projects for integration:

- √ Is the theme or project important enough that it will promote present and future learning?
- √ Does it have substance and application to the real world?
- √ Are relevant learning materials readily available?
- √ Is it meaningful and age-appropriate?
- √ Does it tie into other previous and future units, projects and themes enabling students to make generalizations and broad understandings?
- √ Is it really worth the time needed to plan, prepare and deliver it?
- √ Does it apply to a broad range of academic and vocational subject areas?
- √ Does it lead to the understanding of fundamental patterns, contrasts or similarities?
- √ Will it interest or even fascinate students once they get into it?
- √ Were students involved in selecting it?

See Appendix B for examples of projects and themes that might facilitate integration.

Major Restructuring of Schools

5.

Restructuring courses, programs, departments or entire schools to promote the integration of academic and vocational education.

This approach occurs on a somewhat broader scale than the ones discussed previously, however, restructuring all or parts of entire schools has the potential for many important benefits. This restructuring may take several forms. Some of these include:

- Establishing one or more "academies" in a school which are really smaller schools within the school. An academy typically focuses on one broad occupational field (e.g., health occupations, agriculture, etc.) or less often on one area of student interest such as the performing arts, or the media. The idea is that academy students have their schedules blocked together so that they can attend vocational and most academic classes separate from students in the larger school. Several vocational and academic teachers are assigned to the academy and they teach all the students enrolled in the academy.

  For example, in a large secondary school of 2,000 students there may be a health sciences or health occupations academy enrolling, let's say, 150 students. These are students who have expressed an interest in pursuing health related careers and postsecondary education in the future. Some students may go to work right after high school, many will pursue an associate degree or technical certificate in one of many allied health fields while a few others may go on to four-year universities and major in health related fields. A few may go on to become physicians, nurses and other medical professionals.

  Although many academies are aimed at keeping the potential drop out in school by making instruction immediately relevant to the student's career interests, all academies are not limited to this function. There are high schools organized around a number of academies and all students in the school are enrolled in one of the academies. Often, additional funding is needed to organize effective academies. Additional funds are needed to

reduce class size, provide initial teacher training, fund ongoing teacher planning time and related costs.

Academies have several important advantages including having a smaller number of teachers interact with students over their high school years, establishment of a greater sense of belonging and community due to the smaller school within a school, and the establishment of linkages with employers in the area of the academy. Establishing one or more academies requires some major commitments on the part of school boards and principals, however, the results can be very positive.

- Establishing "magnet" schools. Similar to the academy, a magnet school focuses on a single occupational field. There are magnet schools devoted to aviation, electronics, agricultural science and other areas. These magnet schools can usually be attended by any student in the school district on a first come first serve basis. One potential problem with magnet schools open to any student from throughout the school district is transportation.

- Establishing occupational clusters within high schools. In this approach, there are several occupational clusters around which all instruction is organized. Clusters might be agribusiness, industry, public service, health sciences and business. There are usually no traditional academic departments such as English, math or science nor are there narrowly focused vocational programs such as automotive mechanics, secretarial studies, etc. Academic teachers are attached to an occupational cluster and students pursuing that cluster take the academic courses identified as most relevant for that particular cluster.

The five approaches described in this section represent the basic framework that might be used to integrate academic and vocational education. Let's shift now from these broad models or approaches that have proven successful, and look at more specific strategies that will facilitate implementation at various levels. In the next few sections we will examine detailed activities and strategies that might be used by teachers, administrators, support staff, departments and entire schools to implement the integration of academic and vocational education. While a variety of models and approaches may be used, ultimately someone will have to "Just do it!" As with any instructional innovation, that someone is the **teacher**.

What Can Teachers Do?

Individual Teachers

Teams of Teachers

What Can Teachers Do?

Ask most any student, "So, what did you do in school today?" More than likely you will receive a very typical reply, "Nothin' much!" Educators may be able to shrug off the obvious misperception of what happens in schools--but students, parents, business leaders, and others in the community may not. At the end of a six or seven period day, most teachers would report a great deal of activity in their classrooms. How else could they be so tired? Indeed, teachers are active in the classroom, and trying to motivate a group of tired, restless, uninterested students toward the end of the day is not an enviable task.

But while teachers are actively involved with lectures, instructions, and administrative tasks, far too many students are allowed to take a very passive role in their education. The fortunate ones succeed in spite of this passive role in the classroom because they have other experiences beyond school, supportive parents, and a rich extracurricular environment outside of the classroom to reinforce learning. Unfortunately, a growing majority of our student population is cut off from those critical supports and is being lost in the "one size fits all, learn this because you'll be tested on it" classroom format. Even more disconcerting is the number of students who are reminded daily of what a failure they are by the cover, test, grade, move on classroom routine.

The traditional model of delivering instruction: lecture, practice (AKA answer the chapter questions), take the test is no longer viable as the primary method of instruction. It no longer provides sufficient preparation for the dynamic demands placed upon our graduates in a high tech, global society during this explosive information age. As the world around us changes, so must we in education. And while change is never easy, it is least painful when **you** take control. For teachers, change begins within the classroom walls because integration encompasses not only **what** we teach, but **how** we teach it.

Individual Teachers

Several broad models for integration have previously been discussed in this document and a creative educator could invent literally hundreds of adaptations of those ideas. To demonstrate some of the possibilities, and to reiterate the need for the integration of basic skills we will explore a number of specific strategies that may be used to reinforce those basic skills identified in the SCANS report. These specific strategies will demonstrate how an individual teacher might

integrate academic and vocational competencies while reinforcing reading, writing, arithmetic, speaking and listening in any classroom. In addition, we will outline strategies to increase occupational relevance.

Strategies to reinforce basics

It isn't uncommon for a senior English teacher to remark "If they don't know how to read by now--it's not my job to teach them." The same might be true for the math teacher who complains about inadequate basic math skills, or the vocational teacher who claims that "writing" is not now, and never has been part of our curriculum. However, such excuses wane given the appalling deficiencies of many of our high school graduates, and the increase in employer sponsored workplace literacy programs throughout the country. Reading, writing, and arithmetic must be reinforced and reinstated into everyone's curriculum. Given current workplace requirements, however, the two additional basic skills identified in the SCANS document--speaking and listening--must also be integrated into our elementary, middle grades, high school and post secondary curriculum--particularly high school.

A common complaint echoing through the ranks of both academic and vocational teachers, however, is that "Students just don't read!" or, when given time to read before completing a reinforcement activity, they go straight for the questions and ignore the filler in between the chapter title and the end questions. Students have, if you will, mastered the "look for the bold print" technique, and will occasionally use the index or glossary if they are forced to. They have apparently been conditioned to complete the worksheet, take the test, and proceed to "cover" the next unit or chapter. Furthermore, when a student receives a poor grade for one of those paper and pencil activities, there is little or no incentive to relearn the material since the test is over and the final exam is months away. In our efforts to provide objective evaluations, we have emphasized multiple choice, matching, and true/false testing formats and wonder why students have a difficult time with oral and written communications.

Of course, any teacher brave enough to attempt activities out of that norm will attest to the moans, groans and muttered expletives that accompany the pain of reading, thinking about, or applying what you've learned. We have apparently made it possible for students to succeed by acquiring the necessary dates, definitions, and trivial facts. In the process, however, we have overlooked many opportunities for meaningful application, relevant practice, and academic/vocational integration.

Implementing a more active, student centered approach to learning, and increasing expectations will be more palatable if you demonstrate **why** such a change is necessary. For example, you might need to demonstrate how frequently reading is required in life and work situations. Operating a new microwave, programming the VCR, and installing a new computer game are realistic activities that require reading comprehension. Reading and understanding a new employee handbook, reading a contract before signing, and completing the necessary paperwork to get money back from the IRS are reading comprehension examples that students may relate to. To reinforce the relevance of reading comprehension you might prepare a classroom contract loaded with "mumbo jumbo", and include lots of fine print. Include details like

> the aforementioned parties henceforth and commencing with the initial signing of this agreement, willingly concede to forego any attempt to engage in irrelevant discussions with other similar parties during the aforementioned time frames subject to change only by the authorities and representatives of the School Board of this County.

Give students five minutes to review and sign the classroom contract. Then ask them to explain to a partner what they've just signed. Some other strategies you might use to reinforce reading, writing, arithmetic, speaking and listening in your classroom include, but are by no means limited to the following:

- Students have been conditioned to read for answers rather than understanding. Teach them to skim for key ideas, read for understanding, summarize in their own words, and explain the content to someone else. This incorporates reading, speaking, and listening skills.

- Set students up for successful reading experiences. Limit the time and length of an exercise. Provide an overview of what to look for, and teach students how to pick out relevant and irrelevant data in a narrative or problem solving exercise. For example, instead of allowing a 50 minute period for students to read the entire chapter and respond to workbook questions, guide students through the exercise. Preview key ideas to look for, allow five minutes for reading one or two pages, and "postview" for understanding. Guiding students through the reading exercise will require more of your time, but will reinforce an appropriate preview, read, postview strategy to increase comprehension.

- Use the Jigsaw II cooperative learning model to reinforce reading comprehension. Divide a chapter into four or five sections (or use four or five short articles). A home group of four-five students covers the entire chapter as each student in the group is responsible for one chapter section or article. Students then form expert groups with the other students who are responsible for the same reading assignment and identify key concepts, respond to a worksheet, or otherwise review the details. Students then return to their home groups to "teach" the basic concepts presented in their expert sections. You may, of course, enhance the learning with worksheets, thought provoking questions, or other tools. Home groups might then complete a comprehensive worksheet, study together for a quiz, or write a summary of the key ideas. Students engage in active reading, comprehension, communication, and social skills. Groups may then process their interactions and develop strategies for more effective teamwork to be applied during the next Jigsaw experience.

- Provide weekly or daily instructions **in writing** and insist that students read alone first, seek help from a partner second, and see you last if they have questions.

- Provide necessary resources and make students responsible for looking up information. Dictionaries, writing style manuals, telephone directories, and reference texts are wonderful resources to keep in the classroom. Knowing the answer is a short term gain--knowing how to find the answer is much preferred.

- Avoid providing the answer to a simple question. Ask, instead, "Where could we look for that information?" Another powerful strategy is simply to admit "I don't know the answer, let's look it up together."

- Encourage them to express their concerns through appropriate channels for written communication. For example, in science we might write congress about concerns for the environment; in math we could write a grocer or retailer regarding price comparisons we calculated in class.

- Provide time for oral reading. Students may read aloud to a partner for short limited periods of time to reinforce verbal skills, reading skills, and listening skills. With ten pairs of students reading quietly to each other everyone is actively involved, which is far less threatening and less painful than individually reading aloud before the entire class.

- Identify classroom partners. Any time students read instructions, they communicate to their partner what the instructions mean, and may even check each other's work and communicate corrective feedback.

- Occasionally present progress results in tabular or written format so that students will have to read and interpret the data. Encourage them to calculate the percent increase or decrease, the class average on a quiz, the score needed to bring their quiz average up to an A.

- Make "free time for reading" a reward for a job well done. Provide daily newspaper, teen magazines, or other current reading materials and reward leisure reading when students have completed other assignments.

- Pairs or groups of students might write word problems, case studies or editorials to be used by other groups to reinforce reading, computation, and thinking skills. For example, to integrate math skills into a consumer economics lesson, small groups (three or four students) might create word problems to reinforce the basic math concepts underlying the instruction. For example, groups A and B might prepare a worksheet by making up the problems to cover a specified number of concepts. Group A then solves the problems created by Group B, and Group B solves the problems created by Group A. Groups work collectively making certain that each team member is capable of explaining their solutions. Worksheets are then evaluated and corrected by the initiating team, and correct applications may be demonstrated on the board to involve the entire class.

- Require collaborative or individual mini-research papers, abstracts or other activities to reinforce reading for information. Provide outlines, structured worksheets to guide them through the read and report process until students are comfortable with reporting on their own.

- Create a "look what's in the news" bulletin board and encourage students to take responsibility for keeping it current (partners or groups may rotate the responsibility).

- Students may keep a journal of what happened in class or what they felt about a certain issue. Then by reading someone else's journal students not only become sensitive to individual differences, but also begin to take pride in their written work.

- Rearrange your classroom to facilitate student interaction. Clusters of desks, a circle, or any interactive arrangement makes a powerful statement that this is not a typical classroom.

- Lighten up. Provide humorous reading material, cartoon books, satire. Any reading is better than **no** reading.

- Move your desk to the back of the classroom. This will force you to get away from your desk during instruction, guided practice, and application.

- Get students involved with the instruction. Identify the intended outcomes of instruction, provide possible resources, and let students come up with creative learning strategies.

- Allow students to check, remediate, and evaluate their own performance. Routinely collect their written evaluations of their progress, what they need more practice with, and a possible plan for remediation.

- Make it a practice to begin class with a positive communication. You might ask, "Who will share something they feel good about this morning?" Students listen to one another, express their positive feelings, and learn to respect feelings.

- Never allow wasted time in the classroom. Use three, five, or even ten minutes at the end of class for reinforcement activities that interest students. You might:

  - encourage students to write a note to a friend, as long as they use proper grammar, format, and punctuation.

  - make a game of basic math skills--everyone can review their times tables, attempt a math riddle, or calculate how much money they'd have in ten years if they saved one dollar a day.

  - Hand one student a dictionary and have an "I bet you can't spell this," exercise where a word is called out, all interested contestants write their response, and then wager points, classroom duties, or M&M's if they think they have it correct.

- Teach students to determine meaning by context. Use a difficult word in a sentence and solicit possible meanings from the class.

- Engage students in meaningful role play. How to express anger with a co-worker, how to tell your friend they have bad breath, how to explain that you don't understand something without feeling dumb are all good role play activities.

These strategies represent only a few of the possibilities, however, many of them are immediately useable for both academic and vocational teachers. They require no extra funding, no special approval, and very little extra time. They do, however, require a desire to try something different in the hope that meaningful reinforcement of reading, writing, math, speaking and listening skills will provide a better experience for each and every student.

Strategies to reinforce occupational relevance

Another avenue critical to the integration of academic and vocational education and available to any teacher at any grade level is the appropriate reinforcement of occupational relevance of what students are learning. We need to effectively address student questions like "Where will we possibly use this?" or "Why do I need to know this stuff?" We need to make a clearer connection between book work and real work, between intellectual concepts and reality, between know and do and between the what and the why. Some strategies you might use to reinforce occupational relevance include:

- Venture outside the textbook for reinforcement materials. Use computer manuals, cookbooks, labels from their favorite foods, the school newspaper, a first aid or CPR manual, nutrition charts, and the fine print on advertisements for math, science, or English applications. Students might calculate percentages in recipes, read and respond to editorials in the school newspaper, or flow chart directions for opening a can of soup, or programming a CD player.

- Because following instructions is relevant to any occupation or job, encourage students to write down the procedures and steps to solving a problem. Other students may then read and follow the instructions. If the steps are communicated accurately, the solution should be correct.

- Investigate jobs and careers. Periodically ask students to select one or more jobs from the classified ads, use the *Dictionary of Occupational Titles* to identify occupational and educational requirements, and write a brief narrative regarding their findings. They might investigate the relevance of academic subject areas to each occupational field referencing specific examples of job activities that incorporate math, science, etc. These may be collected and assembled into a career resource reading folder that is bound and used as a reference in class.

- Allow students to reinforce learning with appropriate career information. Interpreting a policy manual, reading insurance information, identifying key terms and concepts on a W-2 form and envisioning an affordable lifestyle based on projected earnings from various career opportunities reinforces the connection between school and work.

- Identify a particular competency that is required for your program. Students might investigate the career or occupational relevance of that specific competency through telephone interviews, the *Dictionary of Occupational Titles*, or even the classified ads. When students determine that a firefighter must know and understand chemical reactions or that a secretary must maintain petty cash, the activity becomes more relevant.

- Use community college, technical center, or university catalogues as career resources. Students can read about and interpret program requirements, courses of study, prerequisites, etc.

- Use a company procedures manual to acquaint students with rules, requirements, regulations, and details relevant to various organizations. Modify a procedures manual approach for your classroom rules, testing procedures, etc.

- Take a career scavenger hunt. Teams of students use library resources to gather bits and pieces of information as specified on their "hunt list."

- Students may keep a career journal by reflecting on various careers they are aware of through first hand experience, friends of the family and television. They might write about job outlook, salary, benefits, pros, cons, educational requirements, and things they want to know. Periodic sharing of career journals may expose other students to the various opportunities.

- Students might research career history of celebrities, famous people, presidents, local heroes.

- Adopt a particular business or industry of the month and read the related trade journals, news items, and possibly even the company policy manual.

- Conduct a phone survey and encourage students to provide the script, identify key issues, and investigate pros and cons of various occupations.

- Invite students to interview parents, relatives, or adult friends regarding the specific application of academic content in the world of work.

- Invite one of the vocational teachers in your school to present a lesson demonstrating the relevance of a specific concept. For example, the home economics instructor might demonstrate caloric intake and how it is calculated, or the business education instructor might demonstrate the correct format and language for a contract or business letter.

These are just a few examples of what a classroom teacher might do to reinforce the occupational relevance of any number of academic areas. Of course, the simpler the strategy the better because you will be more apt to implement the practice. However, if you really want to have some fun with the concept of academic and vocational integration, identify a partner to work with.

Teams of Teachers

There is some truth to the old adage "Two heads are better than one," and while the ultimate match may be for an academic teacher to team with a vocational teacher, any partnering initiative may promote integration and model the teaming concept. If you can successfully identify one other person who might be willing to attempt some new and improved strategies in the classroom, then you are bound for better times. While making changes within your own classroom may be easier, you stand to gain support and camaraderie when you and a partner commit to some collaborative changes. Here are some suggestions:

- Simply invite your next door neighbor, or another innovative spirit in your department to join forces with you. Select one class: either complementary classes that meet the same period, or one class that you both teach. For example, two business teachers might select two Typewriting

I/Fundamentals classes that meet periods one and five, or they might select a Typewriting I/ Fundamentals and Accounting Class that meet period one.

- Identify a time that you would be available for common planning either weekly, biweekly, maybe even monthly to start. Remember, all good things take time.

- Select the most appropriate integration model depending upon your curriculum area (e.g., reinforcing academic content in the vocational curriculum, reinforcing occupational relevance in an academic curriculum, or integrated projects, etc.).

- Review the competencies for one or both of the courses involved, and identify those that are most appropriate for integration.

- Discuss your particular areas of expertise, content preferences, and personal teaching resources. Determine how you might best utilize your collaborative talents to accomplish integration. For example, an algebra and geometry teacher might decide to engage both classes in a field trip to the football field, basketball court, or track. Teams of algebra and geometry students might estimate and measure distances, determine angles or calculate diameters and areas of the various playing fields.

- Establish a goal of weekly or biweekly integration exercises that might be targeted for common competencies or easily modified for your particular curriculum. You might collaborate to develop these activities, rotate development responsibility, or simply identify the best available materials from CORD or other published resources. Another strategy might include switching classes to teach the particular integrated activity that you have developed. With a partner, it's easy to make this kind of classroom switch and your students will enjoy working with someone different once in a while.

- During your weekly or biweekly planning period, review and revise exercises and activities. Monitor and share student reactions, results, and achievement.

- Create a little friendly competition between classes by challenging them to create the best career resource catalog (see previous section) or the most diverse "non traditional careers" bulletin board.

- Celebrate your successes. Engage your partner in a dialogue on most effective strategies for the algebra or technology education classroom. Share your best experiences.

- Network. Business and community representatives may visit classrooms or provide necessary resources to increase the occupational relevance in both vocational or academic classes. Share your contacts with one another, or better yet--invite speakers to address two classes at once.

- Share the good news. Let everyone in your department know how successful your integration efforts are. They will be eager to try activities and strategies that you recommend.

- Allow students a chance at creating learning activities. Each class might take the responsibility for developing or leading an integration exercise for the other class. You'd be surprised how creative students can be when given the requirements and responsibility for other students learning.

- Reward yourselves for a job well done. Since integration takes a little more time and effort, treat yourselves to a celebration breakfast, lunch (even in the cafeteria) or special event.

What Can Departments and Schools Do?

Departments

Schools

What Can Departments and Schools Do?

Individual teachers and teachers working together can do a great deal to integrate academic and vocational education, however, much more impact can be made when integration efforts are on a larger scale such as within a department, across departments or throughout an entire school.

Departments

Integration efforts at the department level can be very successful because there are enough teachers, students and courses involved to provide a "critical mass" large enough to make substantive changes in the way instruction is organized and delivered. At the same time, a department is not quite so large that institutional bureaucracy becomes overwhelming. The following are some ideas that might prove helpful in getting integration activities underway at the department level.

Within An Academic Department

Traditional academic departments such as English, math, science, etc. can provide fertile ground in which to implement many integration strategies. Among these include:

- Implement applied learning strategies throughout **all** academic courses. Provide staff development activities to encourage and prepare academic instructors with the philosophy and skills necessary to deliver their instruction in an activity oriented, applied, hands-on fashion. Dispel the myth that applied instruction is lower level or watered down instruction. Replace it with the idea that applied instruction is just **better** instruction.

- Integrate the content of academic courses with each other. Content among the academic courses students take should be integrated with each other as well as integrated with vocational education. Academic teachers should examine what is being taught in each academic course and the sequence in which it is presented to identify opportunities for better integrating the academic content students learn. For example, a math teacher and a science teacher may discover that they are both teaching the concept of graphing and interpreting data. They might collaborate to avoid duplicating instruction or they might decide to complement one another's

instruction by using the same terminology or they may elect to change the sequence in which it is taught so the dual coverage reinforces one another.

- Compare student outcomes being taught in each academic course to identify outcomes that might be linked or eliminated because of duplication. For example, the student outcomes for the common core of courses taken by all (or most) ninth graders might be compared side by side to identify where commonalities or possible opportunities for linkage and reinforcement might be.

- Rather than focus on "covering" a lengthy laundry list of often disconnected performance standards, consider adopting a set of life and career relevant "competencies" or "workplace knowhow" skills (see SCANS), etc. to "hang" your academic instruction on. This should result in making academic instruction more applied and career relevant. Most likely, the detailed performance standards you were teaching will end up being learned, however, they will be learned as an integral part of accomplishing worthwhile competencies and skills. For example, a history teacher may adopt the workplace competency "collect and evaluate historical data" as one of the competencies of the course. While locating and critically evaluating information from newspaper files as a part of a research report on the civil rights movement in Florida, students may be learning about the history of the civil rights movement, however, they are learning it as they learn the life and career relevant competency of data collection.

- Focus on enhancing the job relevance of academic content taught in each academic course. Working with vocational educators and the local business community, try to identify real world career related applications for each academic concept or skill taught in the department. If after intensive scrutiny, you can't come up with any life or career relevance for an academic concept being taught, you might give serious consideration to **not** teaching it.

- Emphasize the immediate and future relevance of academic concepts and skills taught throughout the entire department to the personal lives of students. Tie what students learn in math, English, social studies and other academic courses to the activities they engage in during their everyday lives. Examples might be linking social studies concepts to the discussion

of a racial incident reported on television, linking biology concepts to teens' risk of AIDS, etc.

- Link what happens in academic courses to the world of work directly through the use of field trips to business sites, the use of guest speakers from a wide range of entry, mid-level and professional level occupations and out-of-school assignments requiring students individually or in teams to job shadow, visit business sites, etc. An example might be to assign teams of geometry students to visit a local building site to videotape or photograph roof trusses being installed in a new home under construction. The class can then analyze the angles of the truss members and determine why each truss was designed as it was. Several related classes in a department might be combined for such activities.

- Encourage all academic teachers in the department to gain business and industry experience during summers or at other times. Such "teachers in industry" activities can be supported through grants, employer supplied wages or in other ways. For example, it might be helpful for an English teacher to spend several months over the summer working in a newspaper or for a physics teacher to work with a civil engineering firm. These teachers might be encouraged to maintain a daily log describing how various academic concepts and skills are being applied in the world of work. Districts and principals might place more weight than they previously have on the extent and variety of previous private sector employment that academic teacher applicants have had.

- Provide staff development opportunities for academic teachers in the department to assist them in acquiring skill in providing learning experiences that mirror how activities are carried out in the real world. Academic teachers should shift away from teaching **subjects** and move toward teaching **students**. Students will soon find themselves involved as parents, homeowners and workers faced with real life problems which most often have no predetermined answer. Also, they will usually find themselves tackling these problems in close cooperation with others. They will have to work collaboratively as a part of a team on the job and they will have to learn how to negotiate, listen, persuade and compromise. Academic teachers might benefit from staff development activities aimed at helping them organize and deliver their instruction so that students are engaged in these same kinds of collaborative, problem solving activities while in school.

- Recognize that most students do not and should not have the same, deep interest and commitment to the academic subject area that you are teaching. You may be teaching chemistry or Latin because that is your life's primary interest. You may have spent four, six or more years of university study becoming an expert in that particular academic discipline. It is not fair to expect the typical student to share your love for your discipline. Don't be disappointed when students express a lack of interest in a particular academic area. Remember that each of them will--like you--have their own jobs and careers which they will be just as interested in and committed to as you are to yours. Perhaps your greatest contribution can be to show students how your particular academic discipline will ultimately make them more productive and fulfilled in their various life roles. Don't expect students to love or understand poetry just because you do.

Within Vocational Departments

Vocational education departments can engage in many activities that will promote the successful integration of academic and vocational education. These include:

- Make sure that vocational instructors--particularly those without degrees--have the academic skills necessary to successfully reinforce academic skills and concepts. Administrators might pay particular attention to this when hiring new vocational teachers--particularly non-degreed teachers.

- Make sure that vocational education teachers communicate to students the importance of their mastering academic skills and concepts.

- When on field trips to job sites, during cooperative education experiences or when guest speakers present special topics, be sure to point out how academic skills are being used on the job.

- Encourage students to read more and help those that may be having difficulty.

- Take time to make sure that students possess the academic skills they might need to learn or perform the vocational competencies you are teaching. If they need to know how to convert fractions to decimals to be able to complete an activity in a precision machining program, for example, make sure they can convert before assuming that they can.

- Whenever possible, reinforce academic concepts from areas other than just English and math such as geography, social studies, literature, music, foreign language, etc. For example, when talking to students in an automotive technology course about the development of the gasoline engine, point out to them on a map the geographic area where the internal combustion engine was invented (Germany) and try to get them interested in some of the history of that time period. Marketing students going into the retail sales field in Florida, for example, should learn how to conduct a sale and answer questions in Spanish.

Between Academic and Vocational Departments

Involving entire academic and vocational education departments in integration activities provides an unlimited number and types of opportunities to make academics more career relevant and to infuse academics into vocational instruction. Below are just a few of the things that can be done when academic and vocational departments work together on integration strategies:

- Have joint planning sessions and common planning periods to encourage academic and vocational teachers to collaborate and jointly plan.
- Share the student outcomes and competencies being taught in the academic and vocational departments to help teachers identify overlap, complementary competencies and opportunities to collaborate.
- Combine academic and vocational students when appropriate.
- Academic and vocational teachers might team teach competencies, units or entire courses.
- Make sure that all academic teachers periodically visit each vocational classroom and laboratory and vocational teachers do the same.
- Combine academic and vocational classes for common field trips or to hear guest speakers.
- Academic and vocational teachers can work together to formally link many of the assignments, projects and activities completed by students in academic courses directly to the world or work--particularly to the occupational area for which vocational students might be preparing.

- Vocational departments and academic departments might share one or more common "integrated learning centers" where students and teachers jointly work on integrated curriculum, projects and activities.

- Assign students major projects requiring them to integrate the major academic disciplines with an occupationally focused project. An example might be for a student interested in forestry to design a detailed plan to reforest a large tract of land near the school. This would not only involve extensive knowledge of and research into forestry, but might also involve extensive math skills, knowledge of botany, soil science, etc. and presenting the plan in a formal written report as well as presenting it orally. The students might have project co-advisors--one from the vocational department and one from the academic department.

- Academic and vocational departments might get together and adopt a major theme for a period of time such as a month or semester. Where possible, learning activities, assignments and projects might revolve around that particular unifying theme.

Entire Schools

Progress toward the successful integration of academic and vocational education can be made at the program and department levels, however, there is vast potential for integration when the effort involves an entire school. When an entire elementary, middle, or secondary school, or technical center or community college adopts integration as a major initiative, all of the resources of the school can be focused on the effort. Among the many strategies schools can employ to integrate academic and vocational education include:

- Examine your school's mission and philosophy statements and make sure that they reflect the notion that the purpose of the school is the preparation of students for successful, self-sufficient lives upon leaving school as well as preparation for further education. Changes may need to be made in a secondary school's mission statement, for example, to provide balance between the college preparation mission of the school and its mission in preparing all students for successful life long employment.

- Consider appointing a school-wide integration task force made up of academic and vocational teachers and students, support staff and guidance personnel to provide overall direction for the integration effort.

- Also, consider appointing an external advisory committee or using your existing school improvement committee to provide input into the kinds of skills, knowledge and competencies high school students need to successfully fulfill their various life roles such as worker, parent, spouse, citizen, consumer, etc. These skills and competencies might be used as major outcomes for both the academic and vocational programs.

- Dramatically increase the linkages with and the presence of business, industry and agencies in your school. Involve the local employment community in all major aspects of the school operation.

- Consider breaking down many of the traditional departmental and curricular barriers that have long separated academic and vocational education. One model is to organize the school around several occupational clusters (e.g., health sciences, industrial-technical, tourism and business/marketing) and have English, math, social studies and other academic teachers assigned to a specific cluster. They can then focus on making their academic content more relevant to jobs and careers within that particular cluster.

- Use the SCANS competencies and foundation and Blueprint 2000 outcomes as the major curricular structure underlying both the academic and vocational programs in your school.

- Move toward an outcome-based or competency-based approach rather than a traditional course or content based approach for the organization and delivery of instruction and for student evaluation.

- Provide encouragement and a structure for the routine mixing and collaboration of academic and vocational teachers on a regular basis.

- Examine the role and activities of guidance counselors; determine if they are placing too much emphasis on preparation for entry into four year universities and not enough on providing career counseling and related activities.

- Establish a process to encourage major revisions in the school's curriculum to integrate academic and vocational education by making academic courses more applied and job relevant and enhancing the academic rigor of vocational courses.

- Make sure that early in students' educational experience, they have an opportunity to acquire extensive knowledge of their own strengths, weaknesses and interests and an extensive knowledge of the world of work. The eighth or ninth grade might be devoted primarily to enhancing students' self-awareness through interest inventories, etc. and enhancing occupational awareness through the use of job samples, etc.

- Make certain that to the fullest extent possible, instructional technology is used throughout the school in the preparation and delivery of instruction and that students interact as extensively as possible with that technology.

- Move away from a knowledge oriented and paper and pencil based approach to grading and student assessment and move toward performance based approaches such as presentation of a student portfolio, completion of a major senior project, etc.

- Provide formal instruction to students in the many life roles they will be called upon to fulfill such as parent, spouse, intelligent consumer, steward of the environment, etc. These inherently interesting activities can be perfect vehicles for learning and applying academic skills and concepts.

- Organize and operate your school as closely as possible to resemble the modern workplace with teachers and students working in cooperative teams, focusing on "continuous quality improvement", on participatory management, etc.

What Can Administrators and Support Staff Do?

What Can Administrators and Support Staff Do?

Leadership is one of the most critical elements required for any change strategy to be successfully implemented in a school. Though pockets of change may exist in almost any environment, the spread of that initiative will be directly related to the support it receives from administration.

Respond to the following questions to quickly assess the climate at your school, then review the recommended steps toward the successful integration of academic and vocational education.

The faculty at my school could easily identify examples to support the following (check those that apply):

_____ 1. We celebrate innovation and reward those who dare to be different.

_____ 2. Our school equally serves the college bound, Florida Academic Scholars, Gold Seal Endorsement, general education, and vocational students.

_____ 3. There is a spirit of collaboration between academic and vocational teachers. Teachers frequently work together to develop curriculum projects that cut across disciplines.

_____ 4. When I walk into a classroom where desks are scattered, noise levels are higher than normal, and students are engaged in head to head conversation or are actively moving around the room, my initial reaction is that active learning strategies are in place (not that Ms. Jones has finally lost control.)

If you celebrate innovation, recognize that students are not equally served in most programs, and are excited by structured chaos and encourage collaboration between faculty members, then you are probably an administrator who is willing and ready to support the integration of academic and vocational education. If you find yourself uncomfortable with any of the above, remember that change can be frightening, but the simple strategies listed below will help you with that process.

- Admit it. There is always room for improvement. Consider all the benefits afforded by the successful integration of academic and vocational education and commit yourself as an advocate for change.

- Read Roland Barth's *Improving Schools from Within* and share it with your faculty.

- Read any of the SCANS documents (see References and Appendix E) and share the critical foundations and competencies with your faculty and staff.

- Create a more collegial environment. Restructure faculty meetings from the typical "tell and sell" to a positive sharing session. To encourage interaction between teachers you might:

  - encourage them to sit with colleagues who share a common planning period.

  - Facilitate a sharing activity and have faculty brainstorm ways they might collaborate on integration projects, themes etc.

  - spotlight one department each month and allow them to share the good news about their programs.

- Spotlight faculty who are using active strategies, cooperative learning, and creative ideas. Create a faculty recognition bulletin board in a central location for students, faculty and parents to view.

- Adopt an integration theme each month and encourage faculty to incorporate the theme into their instruction. Convince media specialists and librarians to reflect this theme in the media center and to identify resources appropriate for faculty use.

- Provide staff development during school, after school or even mini-sessions during planning periods so that all teachers might experience a positive opportunity for change.

- Establish a cross disciplinary core of teachers who would welcome innovation and be willing to attend professional development programs to learn more about specific strategies for integration. These teachers will

soon become your resident experts and may then educate the rest of your faculty.

- Visit classrooms frequently and look for the experts. Try to identify those pockets of change. For example, when you walk down a corridor look for active classrooms and observe what learning is taking place. If, on any given day, you see only the traditional rows of students working quietly in their seats ask yourself what you're doing to reward non-traditional models of instruction.

- Provide a format for teachers to share their long term and weekly lesson plans to encourage positive discussions about classroom strategies. For example, teachers might post upcoming events outside their classrooms or on a special bulletin board in the lounge. It's quite possible that two or more teachers will identify common themes of instruction and be even more inspired to collaborate in the future.

- Establish a "good idea file" and locate it in the faculty lounge. Request one idea (favorite icebreaker, worksheet, strategy for active learning) from each teacher. Collect the materials, have them laminated, and encourage faculty to use the "good idea file." A faculty of 100 could thereby create a powerful resource and a positive addition to any faculty lounge.

- Initiate a teacher switch day and encourage a cross disciplinary switch. Academic teachers may provide relevant reinforcement in vocational classrooms and vocational teachers may provide occupational relevance in any number of academic areas.

- Invite teachers to a scavenger hunt where they are sent around the school to various departments in search of key concepts, observations, bulletin boards, or file cabinets and unleash the potential of integration in a fun-for-all activity.

- Celebrate the successes of creative integration strategies at faculty meetings. But even more important, celebrate the failures. Recognize those who tried a wonderful project that didn't quite work, or that failed miserably. When you create an environment that allows individuals to learn by trial and error, you'll have a lot more trials in the future.

- Encourage guidance counselors, occupational specialists, and other support personnel to experience all of the activities listed here and provide them with the necessary time to do so.

- Contact a representative in the vocational education and/or elementary/middle school/secondary education programs at one of the state universities (e.g., one of the contributors to this project) to identify what assistance might be available for staff development, consultation, and collaboration.

The administrator who models innovation, demonstrates collaboration, and exemplifies creative risk taking is the kind of administrator needed to facilitate proactive integration of academic and vocational education.

How Can We Overcome Obstacles To Integration?

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How Can We Overcome Obstacles To Integration?

We have provided a rationale for integration, identified five models that have proven to be effective, and delineated numerous practical applications that individuals and groups of teachers might use to implement the integration of academic and vocational education. Given the right administrative support and the energies roused by creative collaboration, this dynamic innovation is certainly possible. It is, however, only realistic to discuss potential obstacles and to provide you with a number of creative options that might facilitate long term success.

Keep in mind that the integration of academic and vocational education can be a daunting task and obstacles are to be expected. These may be related to funding, the facility, resources such as curriculum, staffing patterns, lack of time, personality conflicts or other factors (or all of the above!). Don't be too discouraged if you come up against barriers and stumbling blocks along the way--that is just a normal part of change. To fully integrate the vocational and academic curricula requires considerable energy, effort, support and funds. Of course, these are all rarely available when you need them. Look at the implementation of integration as a slow, ongoing process that must be started small and nutured along carefully. Be cautious about expecting too much change too soon. Keep in mind that essentially, we are talking about radically changing the way schools and teachers "do business".

The examples on the following several pages represent real obstacles identified by teachers, administrators, and counselors who are concerned with the integration of academic and vocational education. We have also noted recommended strategies to overcome the obstacles. These strategies, by no means, represent an all inclusive list of options--they are only intended to get you started on a positive course of action.

The number and severity of potential obstacles you might face will vary depending on your local setting including size, personalities involved, degree of sophistiction of your system, current climate for change, how far along you are now and many ofther factors. Rember that if your'e restructuring a large high school you will face many more obstacles (and many more chances for success) than if you are implementing integration strategies within a single classroom.

GOOD LUCK! ·IT'S WORTH THE EFFORT!

Obstacles To Integration and Strategies For Overcoming Them

1. Reluctance of vocational teachers to stress academics in their vocational programs.

   a. academic teachers teach lessons or modules in classrooms and work with vocational teachers to develop more academic exercises.
   b. Readily available resources to support academic reinforcement.
   c. Staff development for vocational teachers on importance of strategies for reinforcing academics.

2. County and school administration views academic and vocational curriculum as separate. Lack of administrative support.

   a. Provide staff development for administrators focusing on the why and how of integration.
   b. Encourage business and industry visits by administrators.
   c. Require academic courses to be more vocational relevant. Applied Physics, Math, and Biology may help overcome this bias.
   d. Expose administrators to successful programs, sites and people.

3. The image that vocational education involves work for the hands not the head, and the mindset that vocational programs are for "dummies."

   a. Staff development where academic/vocational teams collaborate.
   b. Administrators and academic teachers visit vocational classrooms and sit in on vocational program advisory committee meetings.

4. Perceptions among guidance counselors, parents, administrators and teachers that the primary role of high school is preparation for college. Mind set that the majority of students are college bound.

   a. Provide data on the jobs that students in your school will most likely enter and the types and level of education and training required.
   b. Counselors visit business and industry.
   c. Educate on tech prep opportunities that will meet the needs of all students.
   d. Improve marketing of vocational programs to include scope, outcomes, benefits, and post secondary training.

Obstacles To Integration and Strategies For Overcoming Them (cont'd)

5. Teachers resist change. There are no rewards for taking risks so the status quo is maintained.

   a. Testimonials from teachers using integration strategies.
   b. Through staff development and administrative/teacher interaction promote freedom to fail as a necessary step to innovation and educational growth.
   c. Training on what to change and how.
   d. Incentives, rewards, and support for change.

6. Reluctance of teachers to work together. Physical separation of vocational facilities and academic classrooms.

   a. Make a publicity tape of vocational students using academic skills to share in faculty lounge.
   b. Install computer network in school (LAN) linking vocational and academic faculty.
   c. Demonstrate benefits to students and also benefits to teachers such as more involved class, extended resources with a partner.
   d. Start with small number of pilot groups working together, then share successes.
   e. Relocate selected academic classrooms closer to vocational labs and classrooms.

7. Convincing the troops (academic and vocational teachers) of the need to integrate.

   a. Compare overlap and similarity of SPS's or competencies.
   b. Review job market data on necessary skills for the future.
   c. Allow teachers to experience applied teaching strategies to see the benefits first-hand.
   d. Ask academic teachers to really examine the source of students' frustrations, boredom and discipline problems.

Obstacles To Integration and Strategies For Overcoming Them (cont'd)

8. Misconceptions from feeder schools. Resistance from parents.

   a. Prepare articulation agreements, newsletters, etc. to communicate with feeder schools.
   b. Send information home regarding job requirements.
   c. Hold open house for future students and parents.
   d. Encourage visitation to each academic and vocational discipline area.

9. Lack of funding.

   a. Educate legislators and leaders about importance of integration.
   b. Educate parents, business, industry, and community about the benefits of integration.
   c. Focus on non-cost activities such as joint planning, eager volunteers, etc.
   d. Spend existing funds differently, change priorities.

10. Perception that applied and cooperative learning leads to noise and chaos in the classroom.

   a. Admit it; noise and structured chaos are necessary components of active, student centered learning.
   b. Staff development on applied strategies and cooperative learning.
   c. Let teachers experience applied learning first hand.

11. Teachers unfamiliar with other programs, students, etc.

   a. Teachers exchange classes occasionally.
   b. Specially planned visits to various departments, program areas.

12. Academic and Vocational teachers don't know each other very well.

   a. Pair academic and vocational teachers to work throughout the month, semester or year.
   b. Mixed seating at faculty meetings.
   c. Regular visits to each other's classrooms.

Obstacles To Integration and Strategies For Overcoming Them (cont'd)

13. Lack of professional collaboration and planning between teachers.

    a. Post all SPS's or student competencies for all disciplines.
    b. Use centrally located computers loaded with SPS's, lesson plans, curriculum outlines.
    c. Reward collaboration.

14. Not enough time to plan.

    a. Provide extra planning period for selected teachers involved with integration.
    b. Common planning periods to maximize use of limited planning time.

15. Internal politics in School.

    a. Let teachers group themselves rather than being assigned.
    b. Begin with volunteers and then share success stories.

16. Some people will not want to get involved.

    a. Ignore them and focus on those who do want to get involved.
    b. Encourage and reward involvement.

17. Scheduling problems.

    a. Block schedule selected academic and vocational students so integration can be focused.
    b. Let effective and efficient student learning drive scheduling and similar decisions rather than administrative convenience or tradition.

18. Public unaware of integration.

    a. Open house during which parents and guests can actually experience an integrated lesson.
    b. Invite media to come and experience the best of integration.
    c. Establish an integration newsletter.

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Obstacles To Integration and Strategies For Overcoming Them (cont'd)

19. Vocational teachers reluctant to venture beyond their own area or comfort zone.

    a. Remind them of structural changes which may render obsolete some vocational programs which do not keep pace with change.
    b. Help them select area where integration might enhance student performance, and introduce them to academic counterpart.

20. Magnitude of potential change is overwhelming.

    a. Start small; initiate one or two pilots.
    b. Expand gradually, debriefing as you go.

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Appendices

Appendix A

Fifty Nifty Implementation Ideas

The following are 50 practical suggestions, tips, ideas, cautions and the like that might prove useful as individual teachers, small groups of teachers, departments, schools and school districts move forward in implementing integration strategies:

1. Integration of academic and vocational education can't be perceived by teachers as something added onto what they are already doing; it should be "sold" to them as doing what they are already doing but doing it **differently**.

2. Successful integration needs time; it may take a year, two years or even five years for integration to fully take hold.

3. To have a smooth, successful major integration effort, teachers must be empowered to make decisions directly affecting them and their students.

4. Administrators must find some way to provide teachers with individual and small group curriculum development time away from students.

5. Integration should not be perceived as a top-down initiative.

6. Start your integration efforts small, nurture it well and watch it grow.

7. Accept the fact that some teachers and others will resist integration; go ahead and work with those who are willing to change.

8. Try to secure grants and other means for having summer curriculum writing sessions.

9. The administration should create frequent opportunities for teachers to interact.

10. Make sure that you preserve the dignity of vocational teachers who may be weak in specific academic areas and of academic teachers who have little or no work experience.

11. The administration should decide and communicate to everyone involved that the status quo will not be acceptable.

12. Start initially with those who volunteer.

13. Principals and directors should take over teachers' classroom on a routine basis to release them to collaborate and develop curriculum.

14. Consider starting on the academic side of the house by replacing traditional academic courses with applied courses.

15. Send vocational and academic teachers to conferences together.

16. Encourage academic and vocational faculty to have breaks and lunch together.

17. Work closely with local universities to accept applied courses for admission.

18. Block schedule a large group of students with a cluster of academic and vocational teachers who can stay together for some time.

19. Be sure to provide sufficient time to thoroughly plan the integration initiative.

20. Communicate the benefits of integration to teachers very early in the process.

21. Address teachers' concerns about integration honestly and directly.

22. Involve those in the initial planning who will be affected by the change.

23. Have regularly scheduled interdisciplinary workshops.

24. Establish linkages with businesses in the area.

25. Involve parents in the process.

26. Focus on outcomes and skills--not content; teach students--not subjects.

27. Look to the state to provide resources and opportunities.

28. Remember that successful integration can take many forms and look quite different in different programs, departments and schools.

29. Be sure to integrate the various academic disciplines with each other.

30. Identify and analyze the very best teaching practices in your school and share them with others.

31. Don't rely too heavily on pre-packaged curriculum materials.

32. Remember that success depends on teams of teachers working together over the long haul.

33. Keep in mind that success requires equally strong commitment from academic **and** vocational teachers; it can't be one sided.

34. Remember that change is difficult and sometimes painful; there will be false starts, failures, resistance and other obstacles to overcome.

35. Communicate the notion that the integration of academic and vocational is a sound idea that stands on its own merits and is not just a fad being pushed by the state department, the Perkins Act or other source.

36. In times of tight resources, start very small and expand the effort only as resources become available.

37. Try to have at least one person in your school whose total responsibility is to coordinate your integration effort.

38. Be sure to orient students to the integration concept.

39. Stay in touch with new research findings that provide new insights and ideas regarding effective strategies and materials.

40. Link up with a nearby university to provide help with planning your integration effort and in providing staff and curriculum development assistance.

41. Negotiate with a university to award college credit for major integration activities teachers may be involved in.

42. Encourage teachers to document their curriculum and submit their integrated learning activities to writing so they can be shared, reviewed and constantly improved over time.

43. Reserve a special place in the school's professional library for resources dealing with integration.

44. Recognize those who experience early success through release time, awards, plaques, mention in the newspaper and other ways.

45. Find ways to allow teachers to travel to schools where integration is operating successfully; have them bring back videotapes of interviews with students, faculty and administrators if possible.

46. Establish formal and informal linkages with programs, departments or schools similar to yours who are involved in integration efforts.

47. Form an informal or formal "consortium" of departments or schools involved in integration who decide to jointly develop curriculum, hold integration workshops, etc.

48. The most important person at the school level is the principal, director or occupational dean; he or she should be firmly committed to the concept, knowledgeable about integration strategies and should communicate that to all concerned.

49. Consider breaking up traditional courses into integrated instructional modules which meet intensively for two or three hours a day for a brief period of time such as several weeks.

50. Genuinely believe the integration effort will be successful and very likely it will be!

Appendix B

Examples of Projects and Themes

Themes

1. The Heart (You Gotta Have Heart)

    a. Health occupations: Anatomy and physiology of circulatory system, heart diseases, CPR, Bloodmobile on campus.
    b. Geography: Identify areas in world where heart disease is higher and lower than normal, historical trends of heart disease in various countries.

    c. Language Arts/Business Education: Write up summaries, reports, data, etc.
    d .Marketing: Elicit support from American Heart Association and promote speakers, activities, and media coverage.

2. Food and Nutrition

    a. Home Economics: Food groups, food preparation, meal planning, etc.
    b. Science: Daily nutritional needs of people, growth patterns, caloric intake and energy.
    c. Agriculture: Planting/harvesting seasonal vegetables for consumer use.
    d. Math: Computing calories and serving sizes, percent of fat in diet, charting/graphing results.
    e. Social studies: Cultural differences and relationship to food
    f. Music: Create song that reinforces principles of good nutrition, identify other musical references to food.
    g. Language Arts: Write poems, plays, stories involving food.

3. The Circus

    a. Drama/Physical Education: Students learn performing arts related to circus, e.g., clowning, juggling, balancing acts.
    b. Art/Carpentry: Design and build sets, backdrops.
    c. Home economics/Fashion Marketing: Design and create costumes.
    d. Music/Band/Chorus: Create and perform music for circus theme.
    e. Marketing/Business: Design and create advertising campaign, program, invitations, press releases.

4. A World of Our Own

Earth has been devastated and we must start over creating a world on a spaceship.

a. Math/Biology/Health: Based on number of inhabitants, calculate and project needed oxygen, water, sources of nutrition, fuel, light etc.
b. English: Select the classics that must be saved, create new world poetry, prose, maintain log for future generations.
c. Physics/Technology: Design strategies to maneuver in space, methods for survival.
d. Home Economics: Project food, clothing requirements and methods for survival.
e. Social studies: Research past civilizations and propose solutions to current situation, requirements for survival of the human race.

5. Inner Space

Designed to increase self awareness and to enhance understanding and respect for individual differences.

a Psychology: Self awareness inventories, personality, what we learn from our environment, how prejudice and bias can be overcome.
b. Social studies: Trace family tree, identify cultural patterns, differences, contributions to history.
c. Biology: Physical similarities and differences between sexes, races. Students identify their blood type, stress tolerance.
d. Food/Nutrition. Study individual diet and effect on blood sugar, metabolism, etc.
e. English: Students keep journals, reflect on childhood experiences, and share customs, expectations with other students.
f. Journalism/Business Education: Students interview each other and report in a personal news format, create newsletter for each class highlighting a different personality each week.
g. Marketing: Examine the role that advertising plays in self esteem, respect for other cultures, etc.

Projects

1. Fashion Design-Past and Present: Joint project between Fashion Marketing and English students; research history of fashion design focusing on leaders and trends; project future of fashion design; make written and oral presentations.

2. Build a dream house: Major project involving vocational and academic content as students from drafting, construction, electrical wiring and air conditioning reinforce relevance of basic academics (math, physical science, reading instructions). School could design and build a dwelling and auction it upon completion. Project could be modified to build any carpentry product.

3. Products of the Future: Partnerships are formed depending upon the products. Marketing/drafting/carpentry or marketing/home economics/art may team up to design, build, and market a product for the future.

4. Video Productions: Students produce a series of 60 second commercials for school functions (plays, games, open house, school improvement meetings). This involves English, Drama, Arts, Electronics, Music, Math.

5. Foster Grandparents: Students in any discipline adopt an elderly person confined to a nursing home. They might write letters, write poems, make visits, study the physiology and psychology of aging, research historical events and interview their foster grandparent.

6. Adopt a Neighborhood: Students adopt a neighborhood and study traffic patterns, market surveys, income, census data, voting records, crime, etc. Students develop possible programs for residents, ways to involve neighbors in school activities.

7. Environmental Cleanup: Project may be small scale (school grounds) or large scale (lake, coastal area, or air). Students study effects of pollution, human costs, strategies for cleanup.

8. Adopt a business/industry: Classes may adopt a local business and develop strategies to inform employees about good things going on in school. They may study the business, products or services, marketing plans, financial data, stocks, etc.

9. The World Around Us: Classes take an "on campus" field trip with paper, pencil, compasses to increase awareness of surroundings. They may look for angles and relationships of angles, social gathering places, traffic patterns,

noise levels, lighting, distractions, access for physically impaired, etc. Students write their findings, graph results, solve problems.

10. Marriage and Divorce: Home Economics and Psychology students research marriage and its responsibilities, complexities, psychological adjustments, etc. Develop checklist for prospective bride and groom. May also investigate the devastation of divorce--mentally, emotionally, and monetarily. They may develop communication guides, how to stay married tips, or divorce prevention strategies. Students in all vocational programs can explore how working in their chose occupational field might affect their future marriages.

11. Take out to Europe: Joint venture, classes may vary. Given $50,000 investment, and a fast food product guaranteed to be a hit in Europe, cross disciplinary teams of students must develop a plan to bring the product to market.

Appendix C

Examples of Academic Concepts Reinforced in Vocational Education

Vocational Program/Course	Vocational Competency	Academic Concepts/skills
Child Care	Assist with food services	Planning, compute number of servings for each food group, identify bacteria, brainstorm how to get a problem eater to eat, nutritional concepts, child development principles.
Food Production Services	Demonstrate Employability Skills	Efective communication, mock interviews, write resumes, demonstrate appropriate response to criticism.
Family living	Explore customs related to marriage	History of marriage, cultural diversity, reading skills, geography.
	Demonstrate responsible consumer management techniques	Basic math skills, planning, problem solving, reading.
	Identify causes of weight problems/eating disorders	Explain effects of metabolism, calculate daily caloric intake and effect on weight loss or gain.
Food Production	Exhibit safe, secure and sanitary work procedures	Role play first aid procedures for burns, cuts, etc., experiment to show bacteria growth/food storage.
	Use Recipe	Weigh, measure, double recipes, identify physical changes due to cooking.
	Compare characteristics of fresh, frozen, dehydrated and canned food	Prepare chart for differences, formulate color coded map indicating where foods are grown and in which season.

Entrepre-neurship	Create a business plan	Conceptualizing, planning, intermediate math, graphicing/plotting data.
	Identify pro's and cons of various forms of business ownership	Reading skills, interpretation, writing, critical thinking.
	Understand effects of free market economy	Reading skills, interpretation, writing
	Project a business budget	Math, percentages,
Fashion Marketing	Demonstrate clothing construction skills	Measure to determine pattern size, calculate cost of garment, read/follow directions. History and evolution of fashion, occupational needs/ relevance for fashions.
Health Occupations	Wash hands following aseptic practices	Identify micro-organisms.
	Take and record vital signs	Chart and interpret data.
	Convert common weights, measures and volumes to metric	Apply metric system and math skills.
	Perform CPR	Understand human anatomy.
	Work effectively as a team	Leadership styles, giving/following instructions, solve problems.
Marketing	Design point-of-sale display	Art/design, Spelling, grammar, psychology of advertising.
	Compute costs and maintain budget	Calculate and project expenses.
	Understand role and impact of advertisement	Human psychology, social impact of media, statistical application, determining impact.
Graphic Arts	Create rough layout design	Problem solving, decision making.
	Apply printers' measurements	Reading rulers, converting numbers.
	Set-up process camera	Ratios/fractions
	Prepare photo offset plate	Demonstrate effects of light energy (physics)

Word Processing Business Communi-cations	Compose business letters, memos, reports	Grammar, punctuation, spelling.
	Proofread copy and edit	Comparing, decision making, reading for content.
	Select appropriate approach/style for specific communication	Problem solving, written communication.
Computer Applications	Create spreadsheets	Basic math concepts, average, sum, interest, etc.
	Create database for business or personal use	Collect and organize pieces of information.
	Create piecharts, line graphs	Communicate findings.
	Read manual and follow instructions	Decision making, reading, problem solving.
Auto Mechanics	Service auto emissions devices	Problem solving, reading, recording data.
	Interpret auto emissions regulations	Reading, interpretation, critical thinking.
Accounting	Balance a payroll register	Basic math, problem solving.
	Prepare balance sheet and financial statements	Decision making, sorting and classifying information, basic math applications.
	Compute cost of inventory using FIFO, LIFO	Calculations, decision making, problem solving.
Carpentry	Estimate construction costs	Basic math, estimating, ratios, etc.
	Demonstrate shop safety and equipment maintenance	Reading and interpreting information (manuals, OSHA requirements).
	Read and interpret blueprints	Reading and interpreting information.
	Construct wood frame projects	Geometric concepts.

Appendix D

Examples of Making Academic Concepts Life and Job Relevant

Course/ Subject	Competency	Application/Example
Geography	Interpret maps and charts	Research incidence of heart disease in countries throughout world and map them. Construct a visual to depict occurrence.
	Recognize variances in climate	Research regional climate, project best crops, or given a product, calculate effects of regional climate and methods to compensate.
Spanish (or other Foreign Language)	Translate text	Compose translation of data collected on heart disease. Translate advertising brochure from Spanish to English or vice versa.
Literature	Identify and interpret representative examples of American poetry Describe times and period of various pieces	Conduct panel discussion of examples, simulating a business presentation. Research careers, occupations referenced in period pieces.
History	Determine sequence of events surrounding historical period Appreciate contributions of predecessors and forces of change	Examine labor issues, effects on jobs, occupations that changed due to the event. Role play employer/employee situations from historical periods and compare with today.

English	Fill out common forms	Complete business forms (payroll, tax applications).
	Follow written instructions to complete a task	Students follow VCR or phone installation instructions or operations manual.
	Write letters and messages	Write to businesses, Congress, editorials, etc. Write to long distance pen pals on or off campus.
	Writing directions	Physical therapist developing and recording individualized instructions for patients' treatment to follow at home.
	Take notes during a student's oral presentation	Writing procedures manual for any work task.
		Nurse transcribing doctors orders onto a patient's charts.
Math	Calculate perimeter, circumference, and area	Compute area of walls and floors in classroom to order paint, wallpaper, carpet, tile, etc.
		Compute area of football field to determine amounts of fertilizer or for irrigation system.
		Using blueprint, calculate actual measurements for product.
		Estimate number of sheets of plywood needed to cover roof area of house.
	Convert scale measurements	Doubling a recipe, reducing dosage of a prescription, calculating serving size.
	Estimate answers	Read water, electric, and gas meters focusing on correct decimal placement.
	Ratios and proportions	Compute discount, taxes, and sales person's commission on items in stores.
	Place values	Record weights, prices of name brand items, concert sales records, etc. and design bar graphs to communicate results.
Journalism	Identify the who, what, when, where, and how for potential newsbriefs	Create class, school newsletter to simulate format for business communication.

English	Write a short, documented paper	Students interview employers or employees and document quotes, etc. to support statements in narrative summary.
	Recognize meaning of unfamiliar terms from context clues.	Read technical, occupational text seeking to establish meaning through context.
	Read for understanding	Read work related case studies on interpersonal communication or management styles to develop solutions to problems.
	Write a paragraph to support an opinion	Groups collaborate to define pro's/con's of current issue and write paragraph or simulate employees with major concerns over unfair company policies.
	Write a summary of a written passage	Use occupational examples, paralegal reads and summarizes case history, manager reads customer complaint and summarizes.
Chemistry/ Pre-Algebra	Understand metric measurement system	Students determine how many ml equals 1/4 liter, 1/2 liter, etc. Similar lab for weights.
	Write linear equation in two variables and solve	Create a new chemical where variables represent existing chemicals; students follow formulas and calculate solutions.
Applied Math	Distinguish between precision and accuracy	Use vernier calipers in auto shop to measure precision engine parts.
	Calculate percents	Simulate retail manager position and calculate discounts, sales tax, commissions for sales staff.
Biology	Identify parts of human anatomy	Emergency procedures for choking patient; CPR.
	Understand function of major organs, e.g., heart	Determine effect of exercise on heart rate. Take pulse before and after jumping jacks

Appendix E

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Integration Curriculum and Related Materials:

Applied Academics: For information about *Applied Academics* video tapes, student workbooks and related materials contact Betty Jones, State Blueprint Coordinator, Orange County Public Schools, P.O. Box 271, Orlando, FL 32802; (407) 849-3343.

Association for Supervision and Curriculum Development, Interdisciplinary Curriculum Network, contact Ben Ebersole, Department of Education, University of Maryland, Baltimore Co., Wilkens Ave., Baltimore, MD 21228; (301) 455-2378.

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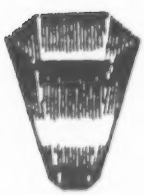

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